Pupils' Geographical Series

THE WORLD

A Complete Geography

- for High Schools -

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P. Vajravelu.

T. S. SUNDARAM IYER

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CONTENTS

BOOK I THE THREE SOUTHERN CONTINENTS
BOOK II NORTH AMERICA
BOOK III EURASIA AND INDIA
BOOK IV A GENERAL SURVEY OF THE WORLD

THE PROGRESSIVE PRINTERS
: MADRAS :

THE
THREE SOUTHERN CONTINENTS

P. Vajravelu.

PREFACE

THIS is the first of the series intended to be used as text books in the High School classes. It is based on the remodelled S. S. L. C. syllabus; but certain items not found in the syllabus have been included in order to present a comprehensive view of the continents studied. Sufficient emphasis has been laid on the human aspect of Geography; and topics in Physiography have been dealt with wherever they occur in the regular course of the lesson.

Exercises are set at the end of each chapter All the questions are to be answered by the pupils and the exercises on maps and graphs are to be done in separate notebooks.

Though a number of maps are found in the book, the reader is expected to make constant use of his Atlas.

T. S. S.

FOREWORD

THIS series of text-books on the geography of the continents has been written for the use of the pupils who intend to take the Madras Secondary School Leaving Certificate Examination and covers the syllabus prescribed by the Board.

Care has been taken to collect and embody the latest available material, to avoid over-loading by eschewing unimportant details and to present the matter in a condensed form without sacrificing clearness.

The latest accepted definition that the aim of geography is to present man and his physical setting as mutually inter-acting agencies, has been steadily kept in mind as for as the scope of the syllabus would permit ; the principles of Physical Geography, therefore, have not received undue predominance, and, wherever necessary, have been explained as concisely and clearly as their applications demand. A wider treatment, however, has been given to the physical laws of climate. The study of the climatic materials found in the pages of these books presupposes an acquaintance with meteorological instruments, weather reports and also some practice in the construction of charts from given data.

The maps and diagrams included in these books have been either specially drawn or adapted to illustrate the leading geographical facts dealt with. and an attempt has also been made to introduce drawings of the characteristic fauna and flora of the main geographic regions.

The questions and exercises appended to each of the chapters have been designed not only to test acquisition but also stimulate reflection and afford training in practical work.

Account has been taken of the fact that pupils who are to use these books have just begun to learn nonlanguage subjects in English; and the language, therefore, has been kept distinctly simple and direct.

The preparation of these books bears the impress of more than a quarter of a century's special study and teaching experience; and when this is said it becomes obvious that any commendation is superfluous.

Ambasamudram,
16th March 1931

T. S. SADASIVA AYYAR.

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PART I

AUSTRALIA

AUSTRALIA

CHAPTER I

POSITION, COAST-LINE, RELIEF & RIVERS

POSITION

AUSTRALIA is bounded on the west by the Indian Ocean, on the south by the Southern Ocean, on the east by the Pacific Ocean, and on the north by some arms of the Pacific. It lies to the south-east of Asia and is entirely in the Southern Hemisphere. Hence the name Australia, for the word *austral* means 'south'. It extends from 10° S. Lat. to 40° S. Lat., and is almost bisected by the Tropic of Capricorn. Nearly half the continent lies in the Torrid Zone.

Again, it lies between 113° and 153° E. Long. Find the longitudes of Perth and Sydney. What is the difference in time between the two towns? * In which town is the time in advance? Why? When it is noon at London, what time is it at Melbourne?

---

* Note that the earth takes 24 hours to rotate 360°. Therefore it takes 1 hour to rotate 15°, and 4 minutes to turn round 1°. Again, the sun appears to rise earlier for places east than for places west. What is this due to?

Area: Australia is the smallest of all the continents. Its area, including that of Tasmania, is nearly 3 million square miles (about one-fourth less than that of Europe, or one-sixth that of Asia). It is more than one and a half times the size of the Indian Empire. Its greatest length east to west is 2400 miles, and its greatest breadth north to south is nearly 2000 miles.

How will you find this from the latitude and longitude of the continent?

Australia was the last continent to have been visited by white men because it was away from the great highways of trade and discovery during the fifteenth and sixteenth centuries. It was discovered only in the 17th century. The English first established a convict settlement at Sydney in 1788. Fremantle, the westernmost port of Australia, is nearly 11,000 miles from London. It is this distant position of the continent that accounts for its late discovery and development.

COAST-LINE

Australia is very simply built; it is a compact land mass with a regular coast-line, like Africa and South India. The chief inlets are the Gulf of Carpentaria in the north coast, Spencer Gulf, St. Vincent Gulf and Port Phillip (the harbour of Melbourne) on the south coast, and Port Jackson (the harbour of Sydney) on the south-east coast. The Great Australian Bight in the south is only a shallow curve in the land and is of no value for shipping. Why?

Look at the physical map of any continent. You will find the sea near the coast is shallow and its depth ranges from 0 to 600 ft. (or 100 fathoms). Beyond the 100 fathom line there is generally a sudden dip in the bed of the sea from 600 ft. to 6000 ft. (The bed of the shallow sea along the coast of the continent is called the *Continental Shelf*.) This continental shelf is formed by the sinking of the land behind the coast. If the land is a plain, then the continental shelf is broad ; but if there is a mountain or highland behind, the continental shelf is narrow. Find from the physical map of Australia where it is narrow and where wide. The islands upon such a shelf are called *Continental Islands*. Tasmania and New Guinea are such islands. Compare Ceylon or the British Isles.

Tasmania, once connected with Australia, is now separated from it by the Bass Strait, 150 miles wide ; a rise of 300 ft. of the bed of the strait would bring out the connection.

The Great Barrier Reef : On the edge of the shelf off the coast of Queensland is the *Great Barrier Reef*, one of the most remarkable natural features in the world. It is a coral reef extending for over one thousand miles and is broken in several places by channels which are opposite to river mouths, (for the coral insects which build the reef do not thrive in fresh water.) These channels are used as passages for vessels. The sea between the reef and the coast is calm and is, therefore, useful for navigation; but there are many sunken reefs which make careful navigation necessary. The waters inside the reef yield pearl-oysters.

RELIEF

Australia falls into three physical divisions (Fig. 1):—
(1) *the Eastern Highlands ;* (2) *the Western Plateau ;* (3) *the Central Lowlands.*

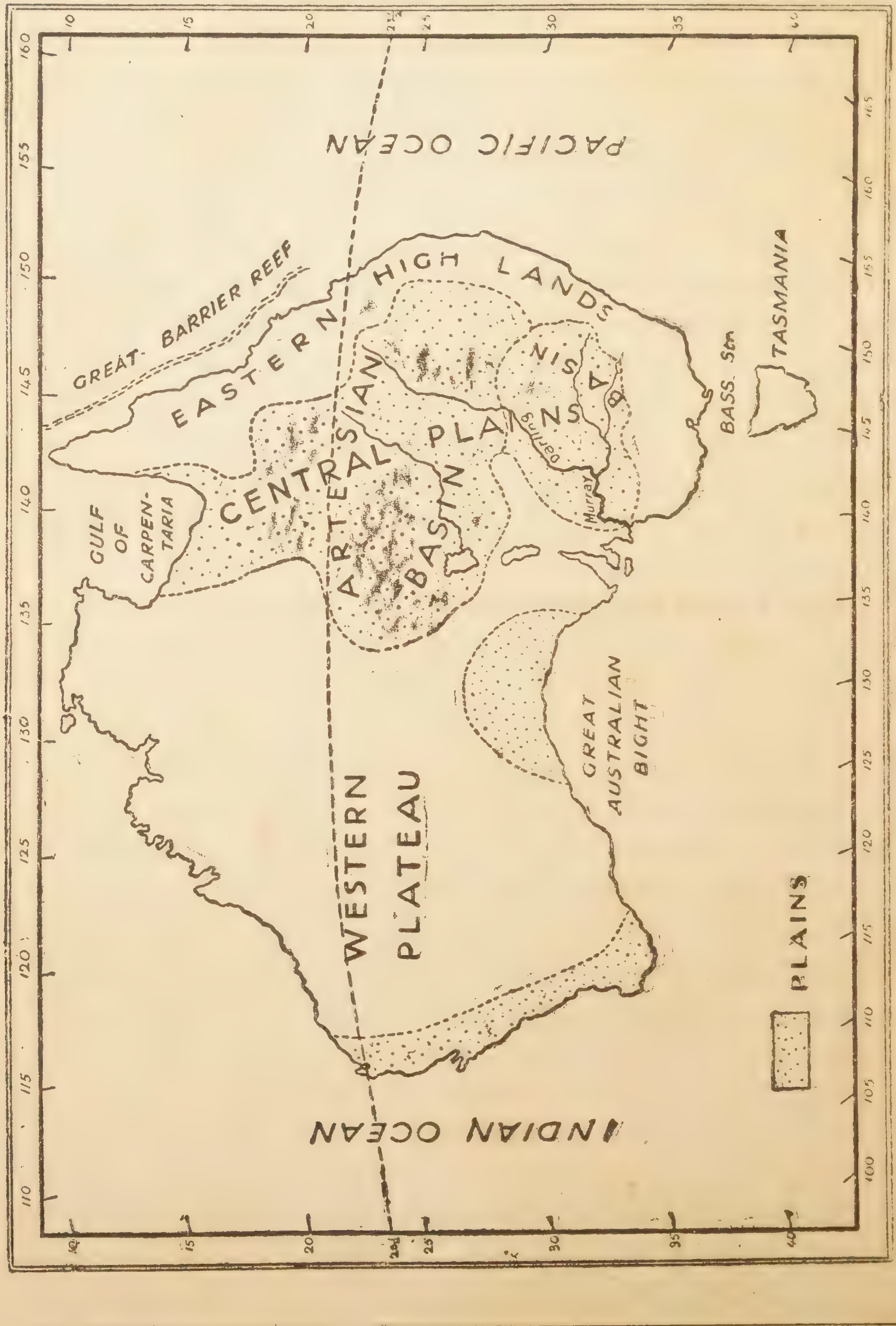
PACIFIC OCEAN
GREAT BARRIER REEF
EASTERN HIGH LANDS
GULF OF CARPENTARIA
CENTRAL PLAINS
ARTESIAN BASIN
BASIN
Darling
Murray
BASS Str
TASMANIA
GREAT AUSTRALIAN BIGHT
WESTERN PLATEAU
INDIAN OCEAN
PLAINS
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Fig. 1. Relief.

(1) **The Eastern Highlands:** These run close to the east coast from Cape York to Tasmania, leaving only a narrow plain in the south-east. They are not real mountains but are the edge of a sloping plateau like the edge of the Deccan plateau; *cf.* the Western Ghats. The seaward slope is steep and the landward slope is long and gentle. They form a water-parting between rivers flowing into the Pacific and those flowing to the lowland areas; so they are known as '*the Great Dividing Range*'. Different parts of the Highlands have different names—*the Darling Downs, the Blue Mountains, the Australian Alps.* The Highlands reach their highest elevation in *Mount Kosciusko* in the Australian Alps (7350 ft.). Compare the height of the Nilgiris. The Highlands prevent the moisture-laden south-easterlies from going to the interior so that the east coast has very heavy rains. Hence in the valleys and plains of the east coast the main population of Australia dwells.

(2) **The Western Plateau:** This occupies more than half the surface of Australia and is made up of very ancient rocks; hence it is rich in minerals. It is almost level, from 600 to 1000 ft. in height, but crossed near the centre by the *Macdonnell* and other ranges. Unlike the Eastern Highlands it has not been cut through by rivers. The western edge of the plateau is called *the Darling Range.* Between this and the coast lies the west coast plain.

(3) **The Central Lowlands:** These extend from the Gulf of Carpentaria in the north to the Southern Ocean in the south. The plain consists of two important regions: (1) *the Murray-Darling Basin* in the south and (2) *the Artesian Basin* in the north, which includes *the Lake Eyre Basin*, an area of inland drainage. The Artesian Basin is so called because many artesian wells (Fig. 2)

have been bored there, and the water from these wells has enabled large areas of dry country to be converted into cattle-rearing regions. The greater part of Queensland and the northern portion of New South Wales are included in this basin. There is a narrow plain all along the coast. *The Nullarbor Plains* of the south extend far inland and consist of limestone. These plains are poor in vegetation as the soil is porous.

RIVERS AND LAKES

The east coast is the best watered part of the continent and there are many streams flowing into the Pacific. On what river is Brisbane situated? As the slope is short and steep, the rivers are all short and swift. Compare the west coast rivers of South India. These rivers have falls which can be used to generate electric power in the future. There are also short rivers on the north coast and in the south-west corner. On what river is Perth situated? In Tasmania water-power has been used on a large scale for the production of electricity.

But the only river system of importance is that of the *Murray-Darling*. The Murray rises in the highest part of the Australian Alps which is covered with snow, and has therefore a more constant supply of water than the Darling. Find out the other tributaries of the Murray. These rivers come down in floods during the rainy season, but they become disconnected pools of water during the dry season. Another drawback to the navigation of the river is its shallow mouth. It flows into *Lake Alexandrina* which is a large shallow lagoon whose outlet to the sea is obstructed by a sand bar. However, the Murray is navigable up to *Albury* for small vessels in favourable seasons. The total

study

length of the Murray-Darling from the mouth of the Murray to the source of the longest tributary of the Darling is 3800 miles which is more than double that of the Indus. The rivers of the system are however very useful for irrigation.

The northern portion of the Central Lowlands is drained by rivers flowing into the Gulf of Carpentaria. Which is the longest of them ? Between these rivers and the Murray-Darling Basin lies the area of *inland drainage.* The rivers that rise here reach *Lake Eyre* which is 39 ft. below sea-level. It is only in rainy seasons that these rivers reach the lake. The longest of these are *Diamantina* and *Cooper's Creek.* But many which flow towards the lake do not get so far. In dry seasons the lake itself is a collection of saline pools and marshes. South of Lake Eyre lies *Lake Torrens;* and west of it *Lake Gairdner.* Far to the north-west lies *Lake Amadeus* in the Western Plateau which often dries up into a plain of saline mud.

Artesian Wells: You have seen that most of the interior of Australia is dry and lacking in rivers. The few rivers that are found shrink into muddy pools in hot weather. In times of drought thousands of sheep and cattle perish and the *squatter* or farmer is ruined. As many as 8,000,000 sheep have been known to perish in a single year of drought. Fortunately, underground stores of water have been discovered in many places and *artesian wells* are now furnishing a steady supply at all seasons.

The artesian area in the Central Lowlands is "basin-shapped" and lies between the Eastern Highlands and the Western Plateau. Here between layers of impervious rock lies a layer of pervious or porous rock. A greater part of the rainwater soaks into the ground through the porous rock in the higher regions and finds its way to the lowest position it can reach. When a bore is sunk through the impervious layer of rock (clay) above, the water rushes up the bore to the surface and discharges as a flowing well (Fig. 2a & b). Sometimes the water spouts up 25 ft. or more into the air. The steady supply of water in the artesian well is due to the pressure of water occuring in the same layers of rock at a higher level in the Queensland Hills. The depth of these flowing wells varies from 10 ft. to 6000 ft., the average depth being 2000 ft.

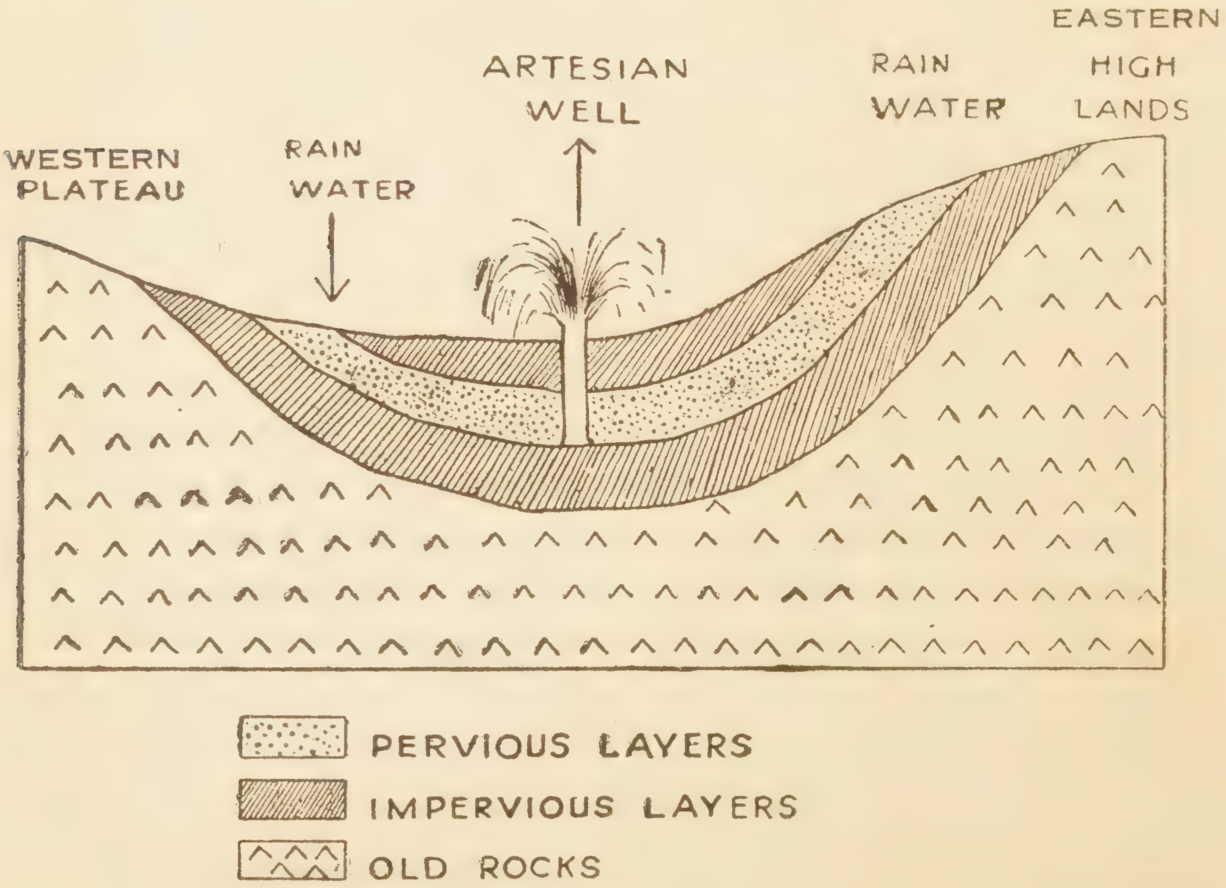


Fig. 2 a. A cross-section of the Artesian Basin.

Much of the artesian water is unsuitable for agricultural purposes owing to the mineral salts dissolved in it. But it is suitable for watering sheep and cattle. Where the salt is less, there men use it for drinking purposes. It is also used for growing some vegetables and fodder. The special value of the artesian wells is to furnish a regular supply of water

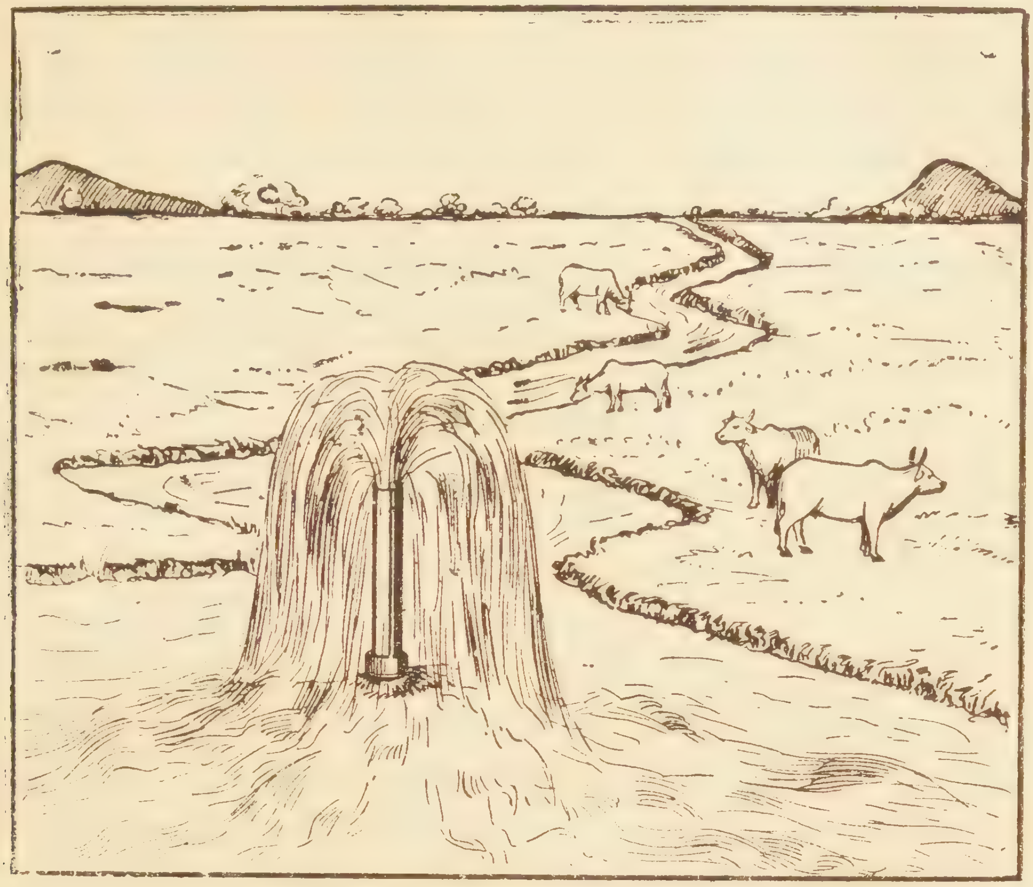


FIG. 2 b. A Flowing Well.

at intervals along the *stock routes* that lead acosss arid regions from cattle-raising districts to the railways and markets. Artesian water is also found in the Lower Murray Basin, the Nullarbor plain, and in several other parts of Western Austrlia.

EXERCISES

(1) What is meant by (i) 10° S. Lat ; (ii) 113° E. Long ?
(2) If it is 12 noon at Greenwich, what time is it at Perth ? When it is 5 p. m. at Sydney, what time is it at London ?
(3) What is the length of 1° of longitude at the Equator ? Why does it decrease towards the poles ?
(4) Which islands of E. Australia are located on the continental shelf ?
(5) What are the advantages and disadvantages of the Barrier Reef to Australia ?
(6) Name the islands to the west of India which are of coral origin.
(7) Why are the lakes of Australia saline ?

CHAPTER II

CLIMATE

INTRODUCTORY

Before studying the climate of Australia, we should remember the following facts about climate in general. The word ' climate ' includes *temperature, pressure, wind, rain and other conditions of the atmosphere.* The atmospheric condition of a day is called *weather*, while *climate* is the name given to the average atmospheric conditions of a place for a year, the average being based on the records and observations of 40 or 50 years. Weather changes from day to day, but climate remains constant.

Temperature : The *temperature* of a place depends upon three factors : (1) *its latitude*, i.e., distance from the equator ; (2) *its altitude*, i.e., height above sea-level ; (3) *its distance from the sea.*

We know that the vertical rays of the sun have greater heating power than slanting rays. As the sun's rays fall vertically between the two tropics and more and more obliquely towards the poles, we can infer that a place near the equator has a greater *mean* temperature than a place farther from it. Again, the temperature of a place varies with the seasons. Owing to the revolution of the earth, the sun's rays are direct north of the equator from April to September and

Sea

Equaliser of temperature

south of the equator from October to March. The six months when the sun's rays are direct form the summer half of the year, and the other six months the winter half. So in Australia the sun's rays are direct from October to March, and as the sun is overhead on December 21 at the *Tropic of Capricorn*, January is the hottest month for the continent and represents its summer. Therefore, July, the middle of the other six months, is the coldest month, and represents its winter.

The atmosphere is not directly heated by the sun's rays. The earth's surface is first heated and this heat is then transferred to the air ; so the layer of air near the surface is warmer than that farther above. The density of the air near the surface and the presence of dust particles in it help to keep it warm. Therefore, the lower a place is, the higher is the temperature of its air. Hence places on the hills have a cooler temperature than those on the plains. (There is a decrease of 1° F. for every 300 ft. of ascent.) (*cf.* Bangalore and Madras.)

Thirdly, the temperature of a land is modified by its nearness to the sea. Land and water in the same latitude do not have the same temperature : because land takes heat more quickly, and also parts with it more quickly, than water. So, in summer, the air over a land is warmer than that over the neighbouring sea ; and in winter the air over a sea is warmer than that over the neighbouring land. Winds transfer the warm sea-air to the land in winter, and the cool sea-air in summer. Thus (the summer temperature of a land near the sea is not very hot, nor is its winter temperature very cold.) Such a place is said to have an *equable* climate, for here the range of temperature is small. But the temperature of a place far away from the sea is not so modified, and it is said

x (near the sea) – neither too hot nor too cold.

nti
em (not near the sea) too hot too cold.

to have *extremes of temperature*, the range being very high. (*cf.* Calcutta and Lahore.)

Pressure and Wind : Where the temperature of the air is high, there the pressure of the air is low ; and where the temperature is low, there the pressure is high. But as we go higher and higher, both temperature and pressure decrease. If one part of the air at a particular level has a greater pressure than another part at the same level, then air from the first place rushes to the second until the pressures in both the places are made equal. Thus, near the surface of the earth, air flows from an area of high pressure to an area of low pressure. Air in motion is wind. Thus winds are caused on account of the unequal distribution of pressure, which is again due to the unequal heating of the air.

There are *four wind belts* on the surface of the earth as shown in Fig. 3 : (1) South-westerly winds : (2) North-

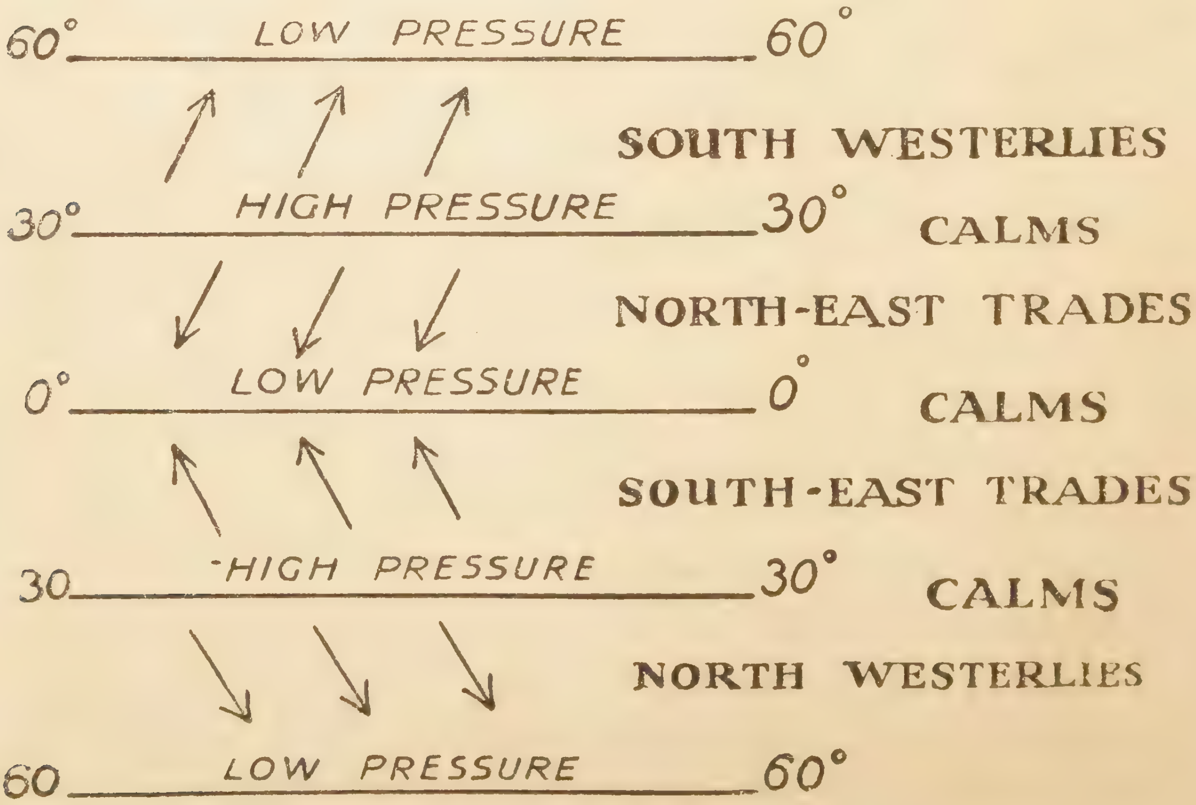


FIG. 3. Wind Belts.

east trades; (3) South-east trades; (4) North-westerly winds. The N. E. and S. E. trade winds blow from about latitude 30° N. and S. respectively towards the equator; but they do not blow exactly from north and south, for the rotation of the earth causes them to blow from the north-east and the south-east. The S. W. and N. W. anti-trades or the westerlies blow from the high pressure belts about latitude 30° N. and S. towards the low pressure belts about latitude 60° N. and S. These winds are also deflected by the rotation of the earth and they are made to blow from the south-west and the north-west respectively. The trade winds are regular, while the westerlies seem always to be changing and are sometimes called variable winds.

The North-westerlies, not being obstructed by any land mass, blow very strongly about 40° S. latitude, and are, therefore, called the '*Brave Westerlies.*' The latitudes where they blow are known as the '*Roaring Forties.*' Thus we see there are two winds blowing within the limits of Australia—'the south-east trades' from the east and the 'brave west winds' from the west.

If the sun were always overhead at the equator these wind belts would always remain in the same position. But owing to the inclination of the earth's axis, the sun appears to move north and south of the equator up to the tropics (See fig. 10, Africa). The equatorial hot belt shifts northwards and southwards along with the sun. Hence the belts of low and high pressure, and with them the belts of winds, also shift with the seasons. They shift only about 10°.

Wind and Rain: The climate of a place is also influenced by the prevailing winds. If the wind comes from the sea, it is generally moisture-laden, but if it comes from the land, it is generally dry. If a moisture-laden wind is obstructed by a mountain range, a line of hills or the edge of a plateau, it is forced to ascend. The rising air expands, and therefore cools; and then the moisture is condensed. Hence there is heavy rainfall on the windward side of a mountain or highland. The wind descends on the other side of the range as a dry wind.

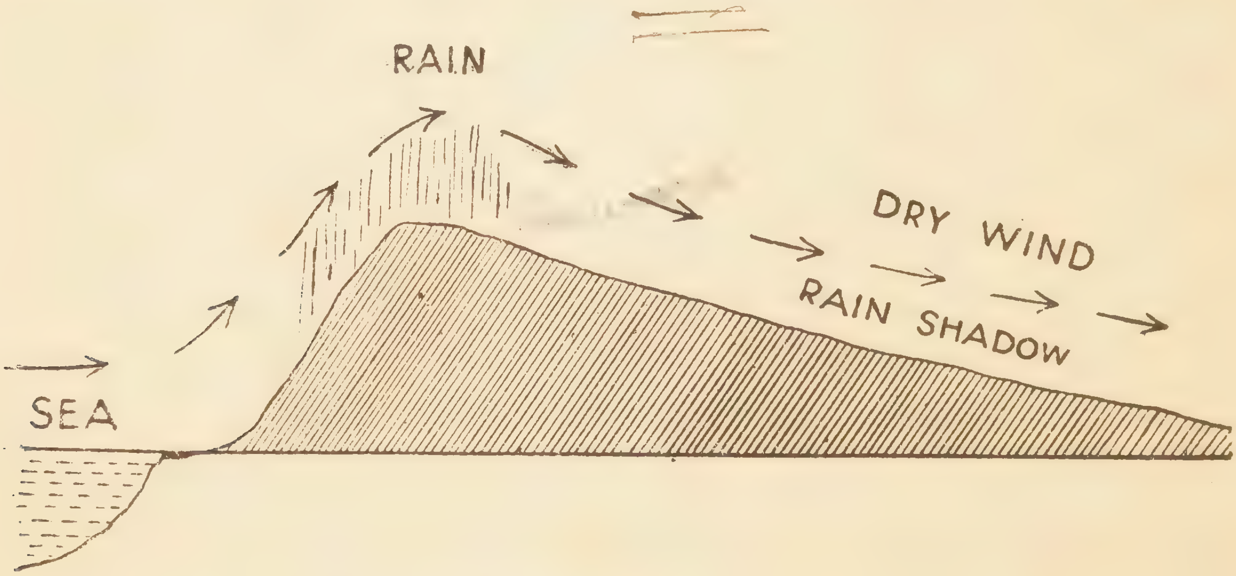
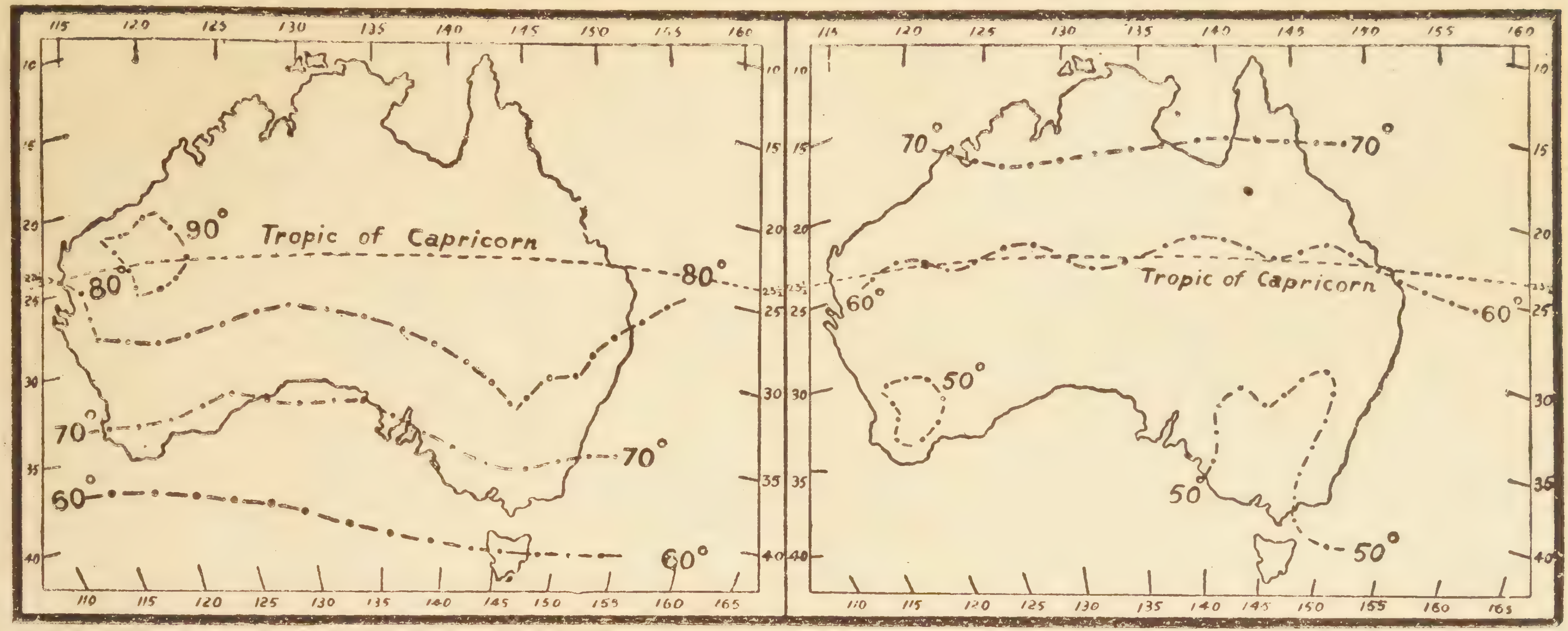


FIG. 4. Effect of mountain barrier on moisture-laden wind.

The dry areas on the leeward side of the range are called *rain shadows* (Fig. 4); e.g., the Eastern Highlands of Australia obstruct the moisture-laden south-east trades which after giving heavy rain to the eastern slope of the highlands escape dry to the lowlands in the west. The Artesian and the Murray-Darling Basins are in the rain shadow.

THE CLIMATE OF AUSTRALIA

The absence of bold physical features and the uniformity of the coast line make the climate of Australia not much varied. The Tropic of Capricorn almost bisects the continent whose north-to-south extent is not very great. This also helps to make the climate uniform.



(a) January-Summer Isotherms. (b) July-Winter Isotherms.

FIG. 5. TEMPERATURE.

Temperature : Look at the temperature maps (Fig. 5 a & b). What are those lines you find there? They are called *isotherms*, or lines passing through places having the same *mean* temperature. Before the lines are drawn, the temperatures are *reduced to sea level.* In January (southern summer) the sun's rays are direct over the middle of the continent and the earth is in its nearest position to the sun. The land has a great east to west extent. These three facts make the middle of the continent very hot and the average temperature is more than 80°F. The temperature increases from the north and south coast to the interior. Thus temperature in summer depends upon distance from the sea. But the north coast being nearer the equator has a greater temperature than the south ; e.g., North Coast : Darwin, 84°F.; Cape York, 81°F.; S. Coast : Adelaide, 74°F.; Melbourne, 68°F.; Interior : Alice Springs (2000 ft.) 84°F. Temperatures over 130°F. in the shade have been recorded in the desert interior.

In July (winter) the temperature decreases from 70°F. in the north to 50°F. in the south. Darwin, 77° F.; Brisbane, 59°F.; Sydney, 52°F.; Melbourne, 48°F. Thus in winter temperature depends mainly on latitude.

EXERCISES

(1) Construct a chart showing the mean monthly temperatures (F.) of the following places :—

	J.	F.	M.	A	M.	J.	J.	A.	S.	O.	N.	D.
Darwin	84·0	83·4	84·1	84·2	81·9	78·9	77·2	79·5	82·7	85·5	87·5	85·3
Sydney	71·6	71·0	69·2	64·5	58·6	54·3	52·3	54·8	58·8	63·4	67·0	70·0
Alice Springs	84·0	82·3	76·7	68·1	59·7	54·4	52·4	58·3	65·6	73·5	79·5	82·4

(Use different designs or colours for different places.)

(2) Find the mean annual temperature of the given places.

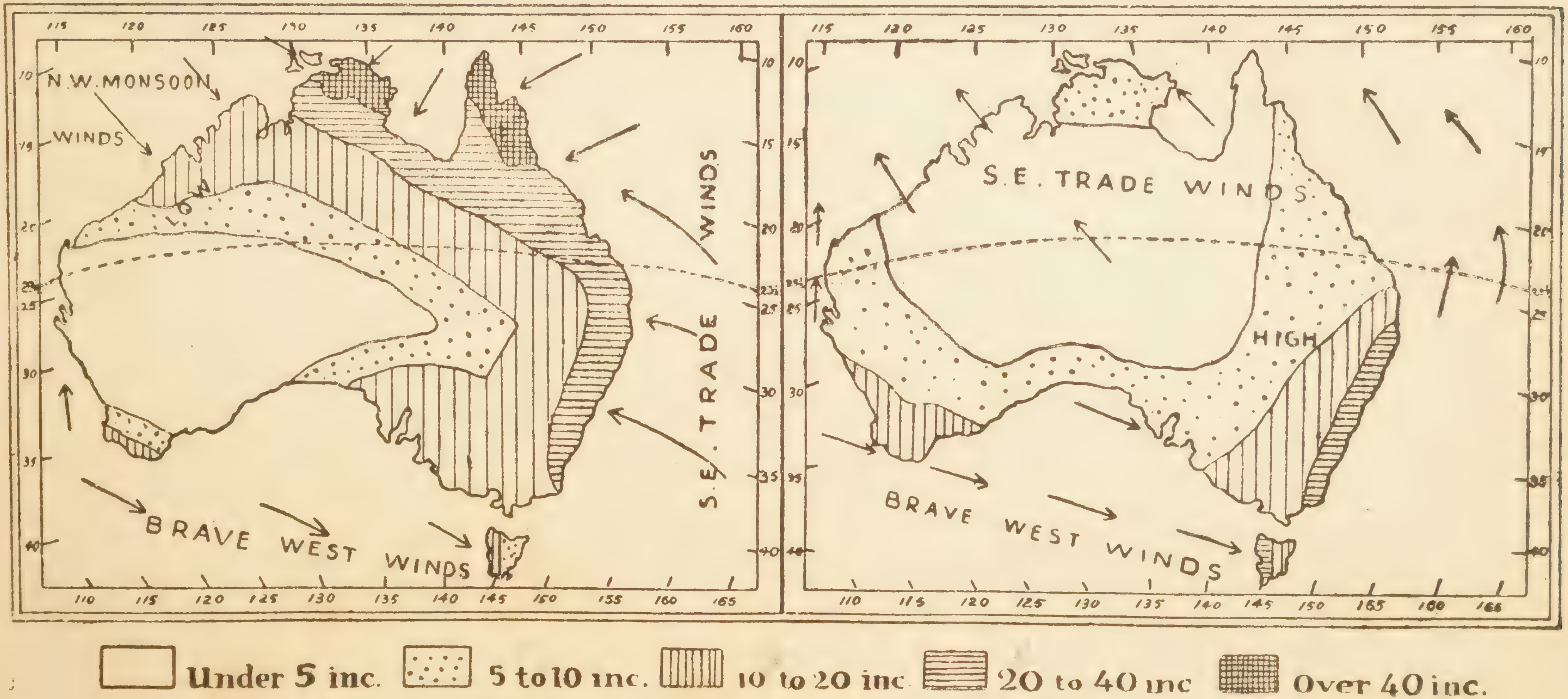
(3) What are "isotherms"? How are the temperatures corrected before being used in isotherm maps? How will you proceed to find the actual temperature of a place which is, say, 6000 ft. above sea level?

(4) Account for the difference in the range of temperature between Darwin and Sydney.

(5) The following table gives the January and July temperatures of certain places. Find the range of temperature in each case. In which places is the range high and in which low? Why?

Places.	January ° F	July ° F	Range ° F
Darwin	84	77	
Alice Springs	84	52	
Perth	74	55	
Coolgardie	77	51	
Melbourne	67·5	48.5	
Adelaide	74	51·5	
Sydney	72	52	
Bourke	84	51	
Broken Hill	79	49	
Hobart	62	46	

Rainfall: Summer Conditions (Nov. to April):— In January (southern summer) the temperature is very high, being over 80°F. (Fig. 5a). Hence the land becomes an area of low pressure (Fig. 6a.), the centre being in the N. W. marked 'low'. N. E. winds of the Indian ocean are drawn in towards the low pressure area, and these winds after crossing the equator form the *north-west monsoon*. What is the change of direction due to? These are called monsoon winds because they are periodic and blow only in one part of the year, *i.e.*, summer. (Compare and contrast with the S. W. monsoon of India.) The N. W. monsoon gives heavy rain to the north coast.



(a) Summer Conditions. (November—April)

(b) Winter Conditions. (May—October)

FIG. 6 RAINFALL.

The S. E. trades, being cut off by the Eastern Highlands, give rain to the east coastal region. Hence the western slopes of the Highlands and Lowlands are in the rain shadow. The south coast is almost dry as the North-Westerlies or Brave West winds blow far to the south of the continent.

Winter Conditions (May to October):—In July (southern winter) the sun is overhead about 23½°N. of the equator. So the interior of Australia becomes comparatively cooled, the temperature being about 60° F. (Fig. 5b). Therefore it is an area of high pressure, the centre being in the S. E. marked 'high'. The S. E. trades blow out of the continent and so northern Australia has no rain except the coast of Queensland (Fig. 6b). The southern part of the continent comes under the influence of the westerly wind and gets some rain. The south-west corner of Australia and the south coast of South Australia and Victoria are said to have a *Mediterranean* climate as they have a *warm dry summer* and a *mild wet winter* like the countries on the coast of the Mediterranean sea.

Tasmania always lies in the track of the westerly winds, and therefore has rain throughout the year; but its western half being exposed to the wind has greater rain than the eastern.

The interior of Australia cannot be reached by the rain-bearing winds, and is, therefore, very dry. Hence a large part of the interior is desert. Note that Australia lies about the same latitudes as the other great deserts of the world, namely, the Tropics,

Climatic Divisions:—According to the seasonal distribution of rainfall, Australia can be divided into five climatic divisions:—(1) *the north and north-east with very heavy summer rains*; e.g., Darwin: summer, 42″; winter,

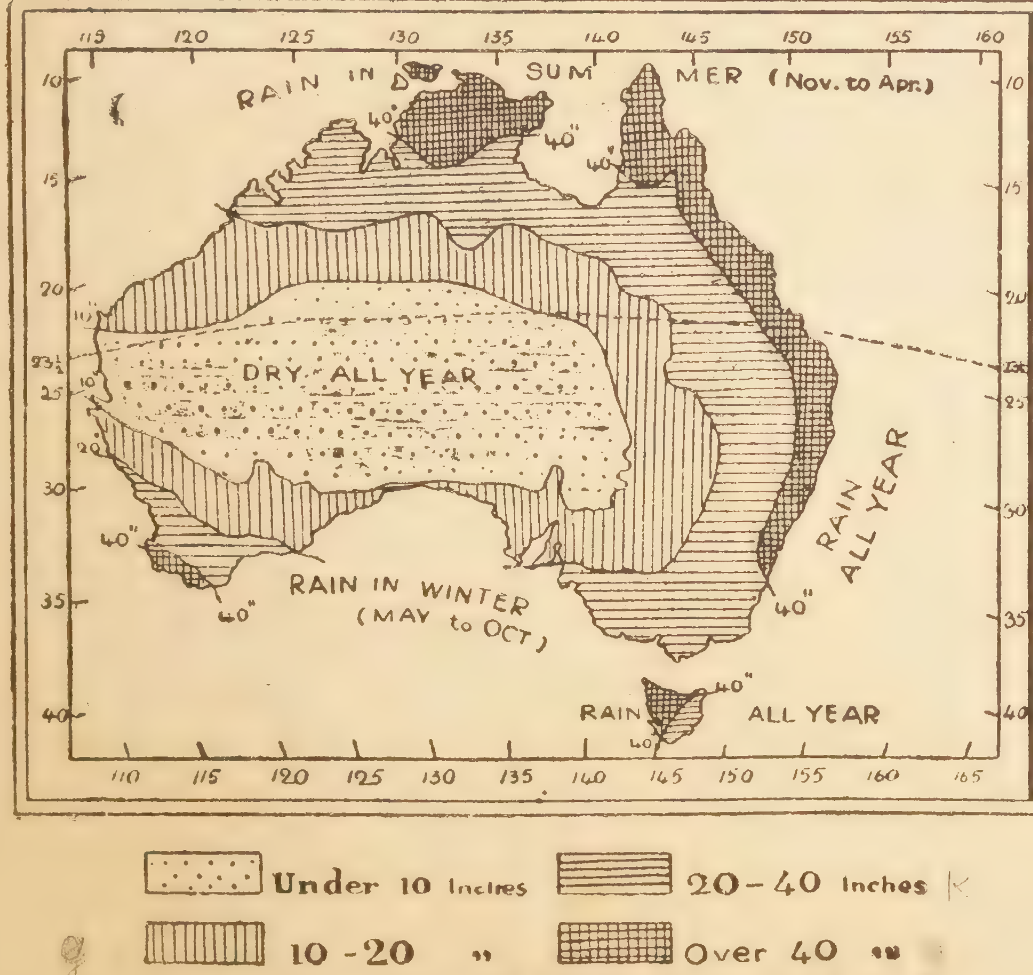


Fig. 7. MEAN ANNUAL RAINFALL.

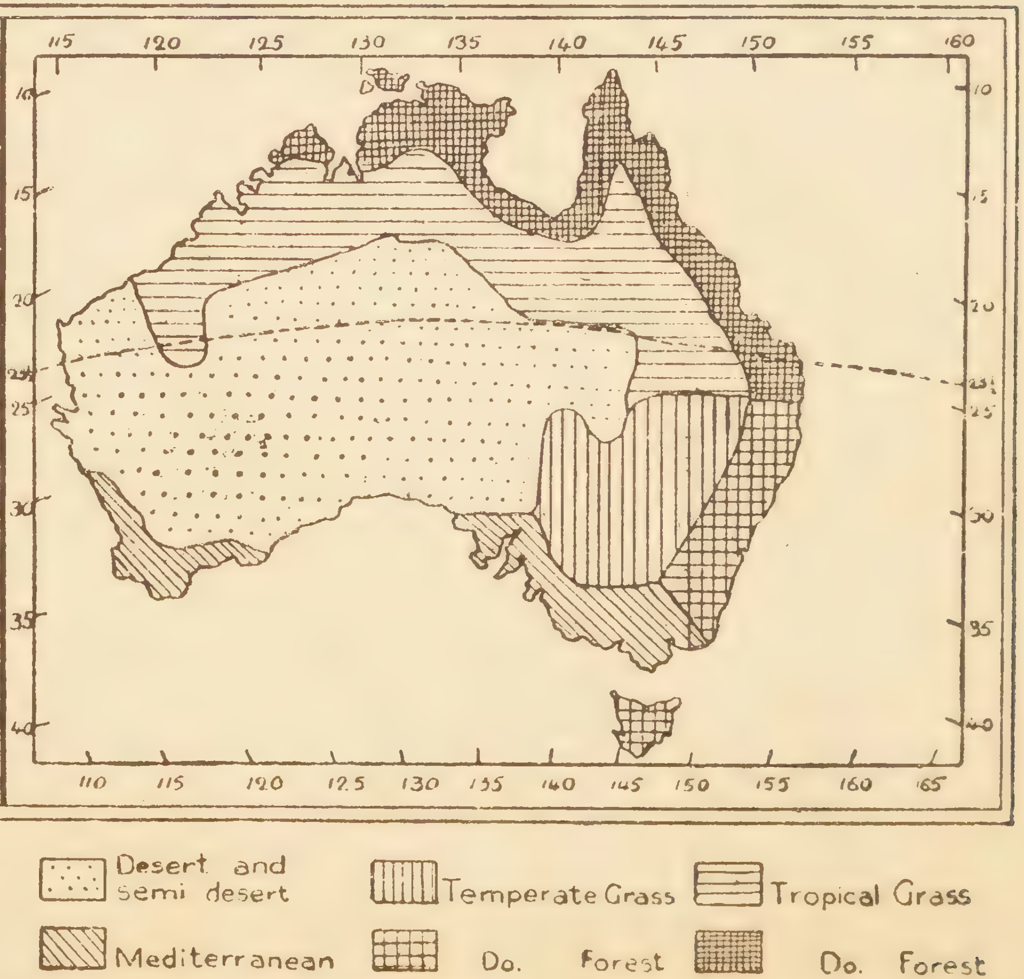


Fig. 8. NATURAL VEGETATION

½″; (2) *the east and south-east with rain at all seasons*; e. g., Sydney: summer, 10″; winter, 14″; (3) *the south and south-west with winter rains*; e. g., Adelaide: winter, 8·25″; summer, 2·25″; (4) *the arid interior having less than 10″ annual rainfall*; e. g., William Creek, 5·2″; (5) *Tasmania with rain all the year*; e. g., Hobart: summer, 5·25″; winter, 6·25″ (Fig. 7.)

(N.B. Summer: Dec.—Feb.; Winter: June—Aug.)

EXERCISES

(1) Compare the seasonal distribution of rainfall (in inches) of the following places and account for the distribution in each case:—

Places	May to Oct. Winter half	Nov. to Apr. Summer half	Mean Annual
Cape York	5·4	76.6	82·0
Brisbane	15·0	32·0	47·0
Sydney	23·8	24·2	48·0
Bourke	6·0	9·2	15·2
Broken Hill	5·2	4·1	9·3
Melbourne	13·0	12·7	25·7
Hobart	12·3	11·1	23·4
Perth	28·9	4·4	33·3
Coolgardie	5·6	3.4	9·0
Darwin	3·7	58·0	61·7
Alice Springs	3·1	7·9	11·0
Adelaide	14·4	6·2	20·6
William Creek	2·4	2·8	5.2

Classify the above towns under the following heads:—

(i) Having most rain in summer. (ii) Having most rain in winter. (iii) Having rain all the year. (iv) Having scanty rainfall.

(2) Compare the climate of Cape York Peninsula with that of Tasmania.

(3) Explain why a large part of the interior of Australia is dry.

(4) Construct diagrams to show the mean monthly rainfall (in inches) of the following places :—

	Ja.	F.	Mr.	Ap.	M	Ju.	Jl.	Au.	S.	O.	N.	D.
Darwin	15·3	13·0	9·7	4·5	0·7	0·2	0·1	0·1	0·5	2·1	5·2	10·3
Alice Springs	1·8	1·7	1·3	0·9	0·6	0·6	0·4	0·4	0·4	0·7	0·9	1·3
Sydney	3·7	4·7	5·1	5·2	4·9	5·2	4·7	3·3	2·9	2·8	2·7	2·6
Perth	0·3	0·3	0·7	1·7	4·9	6·6	6·4	5·6	3·3	2·1	0·8	0·6

(5) 'In Australia rainfall decreases from the coast to the interior.' Illustrate.

(6) What change in the climate of Australia would be produced if the Highlands were to be along the western margin?

CHAPTER III

VEGETATION AND ANIMALS

Natural Vegetation : As in other continents, here also there is a close connection between rainfall and vegetation. Compare Fig. 7 and Fig. 8. The *hot wet forests* along the north coast and along the coast of Queensland as far south as 25° latitude, the *warm temperate forests* on the south-east coast of New South Wales, and the cool *temperate forests* of Tasmania correspond to regions of heavy rainfall (over 40 in.). In the interior where rainfall is not sufficient for the growth of trees, there are grass-lands. The grass-lands are of two kinds: (1) the savannahs or *tropical grass-lands* to be found in the south of the tropical forests, (2) the *temperate grass-lands* to be found in the Murray-Darling Basin.

In the south-west S. Australia and southern Victoria (regions of winter rainfall) the vegetation is of the *Mediterranean* type, i.e., plants and trees that can stand the summer drought. The dry interior is *desert* and *scrub* or poor grassland. Here the rainfall is very scanty and the vegetation consists of thorny bushes (*e. g*., the spinifex) and coarse grasses. To the west of the temperate grassland lies the *mallee* region where the trees are stunted, with large numbers of their trunks shooting out from one root. The trees which are only about eight or ten feet high grow so close together as to be almost impenetrable.

Natural Regions : From what we have learnt about the climate and vegetation of the continent we can divide it into the following *Natural Regions* (Vide Fig. 8) :—

Region.	Climate.	Vegetation.
(1) The North and North-East Coastal Region.	Hot throughout the year, heavy rain in summer due to N.W. Monsoons.	Tropical forests.
(2) Lands behind the North and North-East Coastal Region.	Hot throughout the year ; rain in summer decreasing towards the interior.	Tropical Grasslands or Savannahs.
(3) The South-East Coastal Region.	Hot summer, cool winter ; rain at all seasons due to S. E. Trades.	Warm temperate forests.
(4) The Murray Darling Basin.	Warm temperate with rain in summer decreasing from east to west.	Temperate grass of the steppe or prairie type.
(5) The "Mediterranean" Region.	Hot dry summer, cool winter with rain from the Westerlies.	Mediterranean vegetation, fruits & forests.
(6) The Arid Interior.	Dry all the year, hot summer and warm winter.	Scrubs and thorny plants.
(7) Tasmania.	Warm summer and cool winter. Rain throughout the year from the westerlies.	Cool temperate forests.

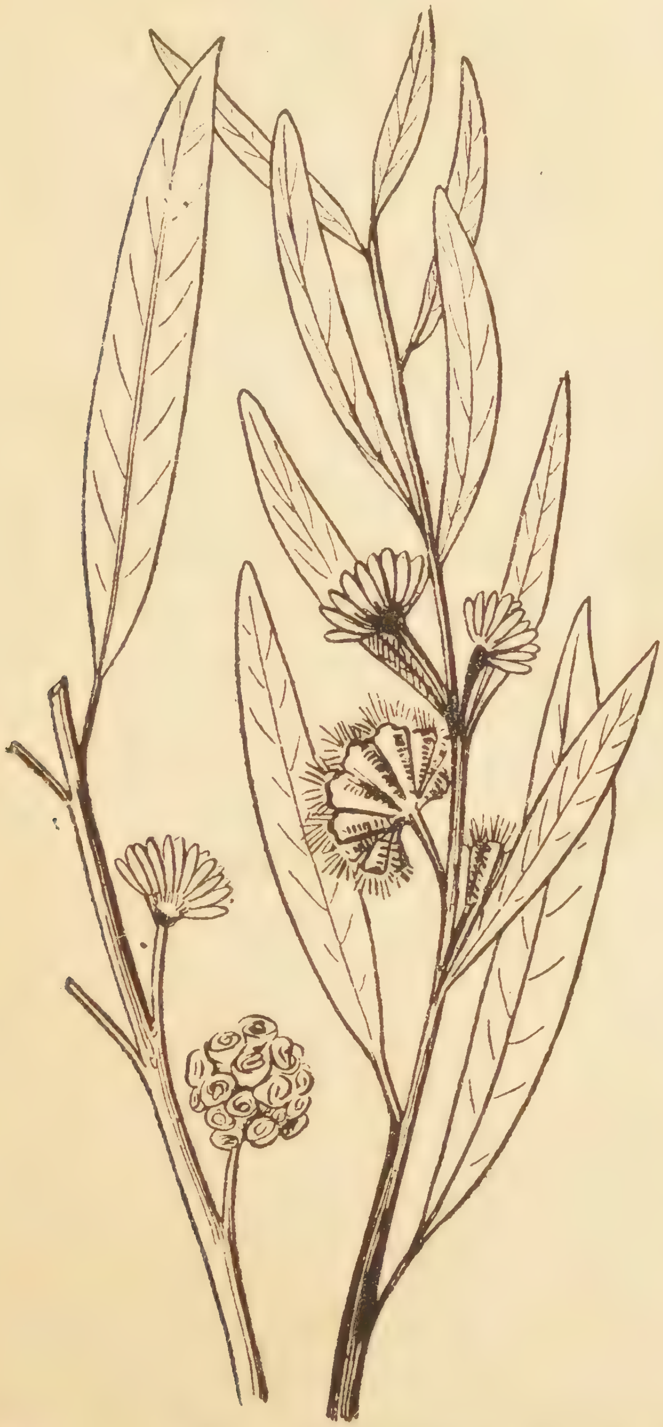
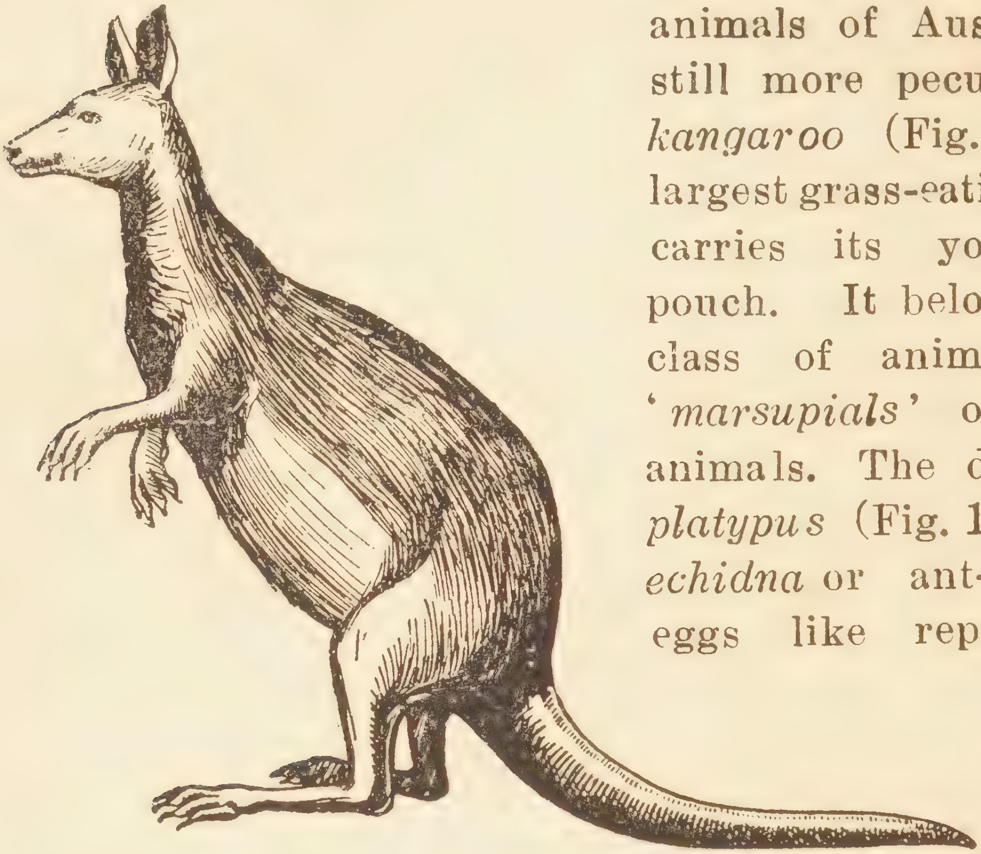


FIG. 9. The leaves, flowers and fruits of the Eucalyptus.
(Note the vertical position of leaves.)

Native Plants: The trees of Australia are peculiar. The chief of them are of the *eucalyptus* family of which there are many varieties. Some of these are tall, growing to a height of 250 to 300 ft. These trees shed their barks instead of their leaves, and give little shade, for their tough leaves are arranged vertically (Fig. 9). The *karry* and *jarrah*, big timber trees of S. W. Australia, belong to this family. The trees are adapted to the dry climate. The vertical position of the leaves prevents evaporation as only their edges are exposed to the direct rays of the sun.

The eucalyptus trees, ordinarily called *gum trees* are highly valued for their timber. From the leaves of one of the varieties—the blue gum—the medicinal oil is prepared. Another tree of importance is the *acacia* or *wattle.* The wood of this tree is chiefly used for cabinet-making, and its bark is used for *tanning.*



Native Animals: The animals of Australia are still more peculiar. The *kangaroo* (Fig. 10), the largest grass-eating animal, carries its young in a pouch. It belongs to the class of animals called '*marsupials*' or pouched animals. The duck-billed *platypus* (Fig. 11) and the *echidna* or ant-eater lay eggs like reptiles, but

FIG. 10. The Kangaroo (six ft. high while standing erect). It can leap over a fence 9 ft. high.

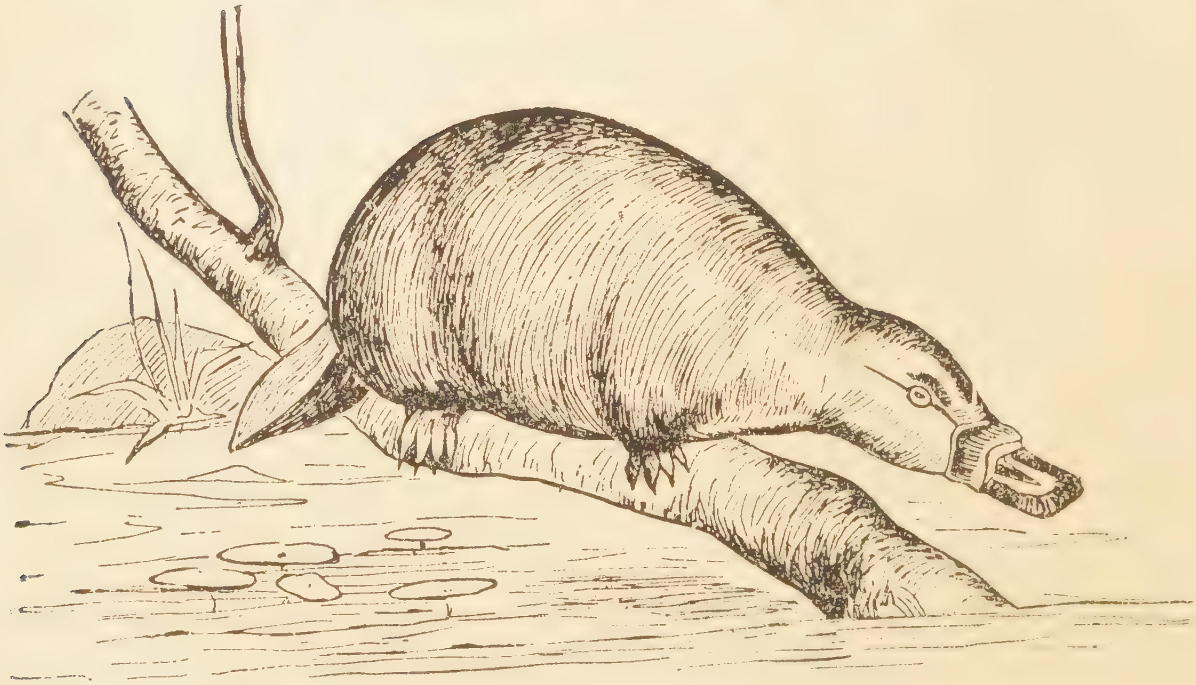


FIG. 11. The Platypus or Duck-Bill
A small animal about 20 inches long, resembling the beaver in shape and habits; has webbed feet; lays eggs like those of a reptile.

suckle their young. Many of the birds have bright plumages, but their voices are not sweet; e.g., the *lyre bird* (Fig. 12), the *bird of paradise*, and the *cockatoos*. The *emu* (Fig. 13) and the *cassowary* are large running birds like the ostrich. The peculiarity of the animals is due to the long separation of the continent from the rest of the world by deep seas. Though there are island stepping-

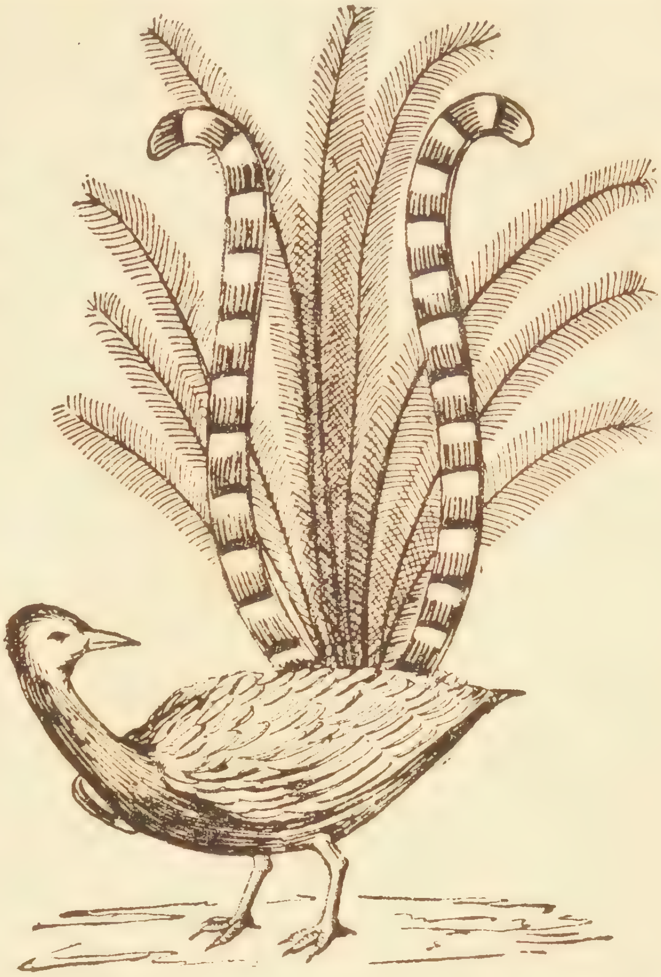


FIG. 12. The Lyre Bird. Its tail is like the lyre, an old musical instrument.

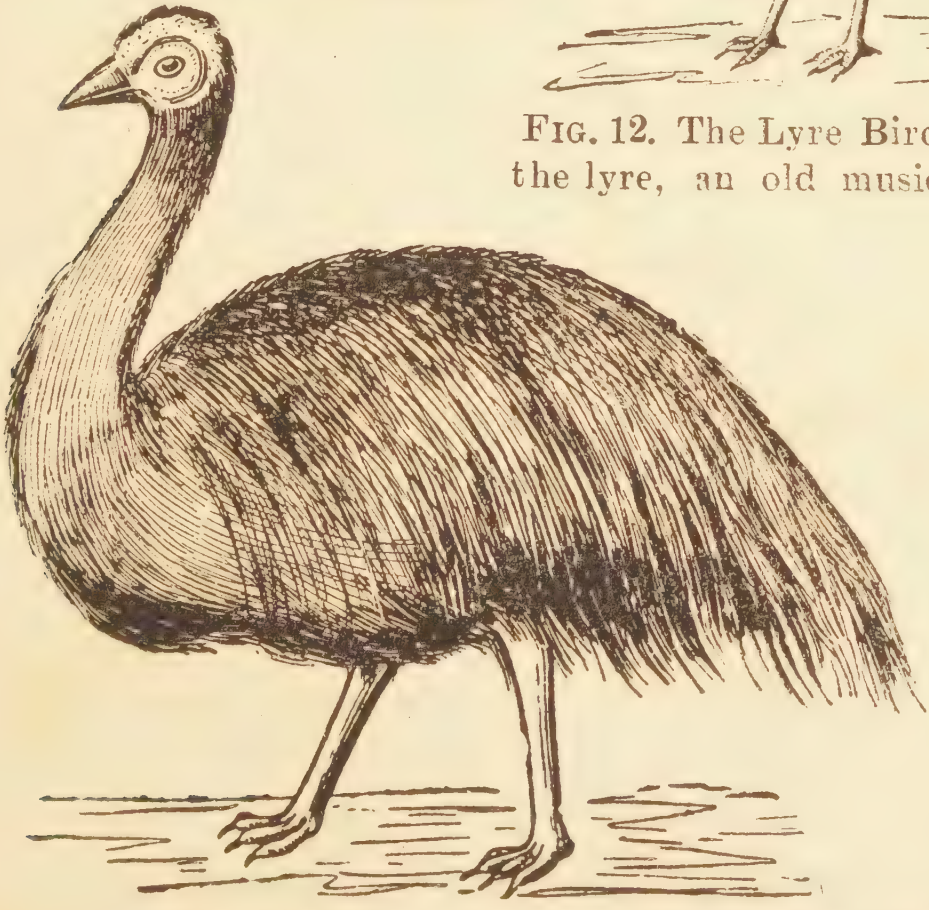


FIG. 13. The Emu (a stately bird 6 ft. high).

stones between Asia and Australia, the deep sea between the islands of Bali and Lombak separates Asiatic animal life from that of Australia.

Few of the Australian animals are of value, either for their skins or their flesh. So European settlers have introduced animals like the *cattle*, the *sheep*, the *horse* and the *pig*. The *rabbit* was introduced as a pet, but it so multiplied that it became a national danger by the great damage done to the grasslands. So rabbit-proof fences had to be erected in many districts. But in recent times the trade in frozen rabbits has counter-balanced the damage caused by them. *Camels* have been brought from Afghanistan to cross the desert.

The Natives of Australia: The aborigines of Australia are closely allied to the hill tribes of the Deccan. They are dark-brown with black hair, large mouth, short flat noses and small sunken eyes. Owing to the lack of food plants and domesticated animals, they have to live by hunting and fishing. Their implements are made of stone or wood, and they are of low civilisation. They are skilful in the use of the spear and the *boomerang*, a curved wooden weapon.

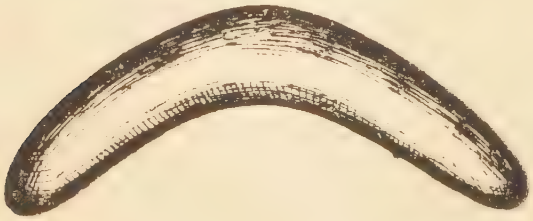


FIG. 14. The Boomerang.

In the early days of settlement there was war between the 'black fellows' and the white farmers, in which the former were often killed in great numbers. Like the native animals, the aborigines are dwindling in number. There are now only about 60,000 of them, and they are confined to the margins of the desert or government reservations. They still live by hunting. The natives of Tasmania are already extinct. The present development of Australia is due to the European immigrants and the animals and plants which they have introduced.

EXERCISES

(1) Explain the relation between natural vegetation and rainfall.
(2) What are "Natural Regions"?
(3) How do the plants of Australia adapt themselves to the climate of the continent?
(4) What is the peculiarity of the native animal life of Australia due to?
(5) Why did the natives of Australia live by hunting?

CHAPTER IV

POLITICAL DIVISIONS, PEOPLE, POPULATION AND INDUSTRIAL DEVELOPMENT

At the close of the last chapter it was said that the present development of Australia is due to the European immigrants. Who are these immigrants? When and how did they come and settle here? In what directions has the country been developed? These are some of the questions which we have to answer in this chapter.

HISTORICAL SUMMARY

Australia was first known to the Dutch and the Portuguese who pushed east and south from the Malay Archipelago. The Dutch gave the name of New Holland to the northern shores. In 1642 Tasman, a Dutchman, touched Tasmania, but he did not know that it was an island. He first called it Van Dieman's land. But the Dutch made no settlements here. It was in 1770 that Captain Cook, an Englishman, discovered the fertile east coast and landed at Botany Bay, so called on account of the variety of vegetation found there. The remoteness of the land seemed to fit it for convict stations. The first convict settlement was established in 1788 on Botany Bay which was afterwards removed to Port Jackson. Here Sydney was built and round it New South Wales grew up. Ten years after this, Dr. Bass discovered that Tasmania was an island and the strait separating it from the mainland has been named after him. Settlers began to spread along the coastal plain of N. S. Wales, as the routes to the interior were blocked by the Blue Mountains.

This led to the establishment of fresh penal settlements at Hobart in Tasmania and at Brisbane in Queensland. Settlements on the Swan River in Western Australia, at Adelaide in South Australia, and at Melbourne in Victoria soon followed. But these settlements were made not by convicts but by free settlers. Gradually the transportation of convicts was stopped and these six settlements formed separate colonies. The great increase in the size of the settlements followed the discovery of gold at *Bathurst* (N. S. Wales) in 1851 and later at *Ballarat* and *Bendigo* (Victoria). This led to a large increase in the population. Western Australia owes its rapid growth to the discovery of gold in 1890. All the six colonies were united in 1901 to form the *Commonwealth of Australia.*

POLITICAL DIVISIONS

The Commonwealth of Australia (Fig. 15), a self-governing British Colony, is a *federation* of six states, each of which is self-governing. The States with their capitals are :—

State.	Capital.	Population of Capital.
(1) New South Wales	Sydney	1,070,000
(2) Queensland	Brisbane	274,000
(3) Victoria	Melbourne	944,000
(4) S. Australia	Adelaide	317,000
(5) W. Australia	Perth	180,000
(6) Tasmania	Hobart	55,000

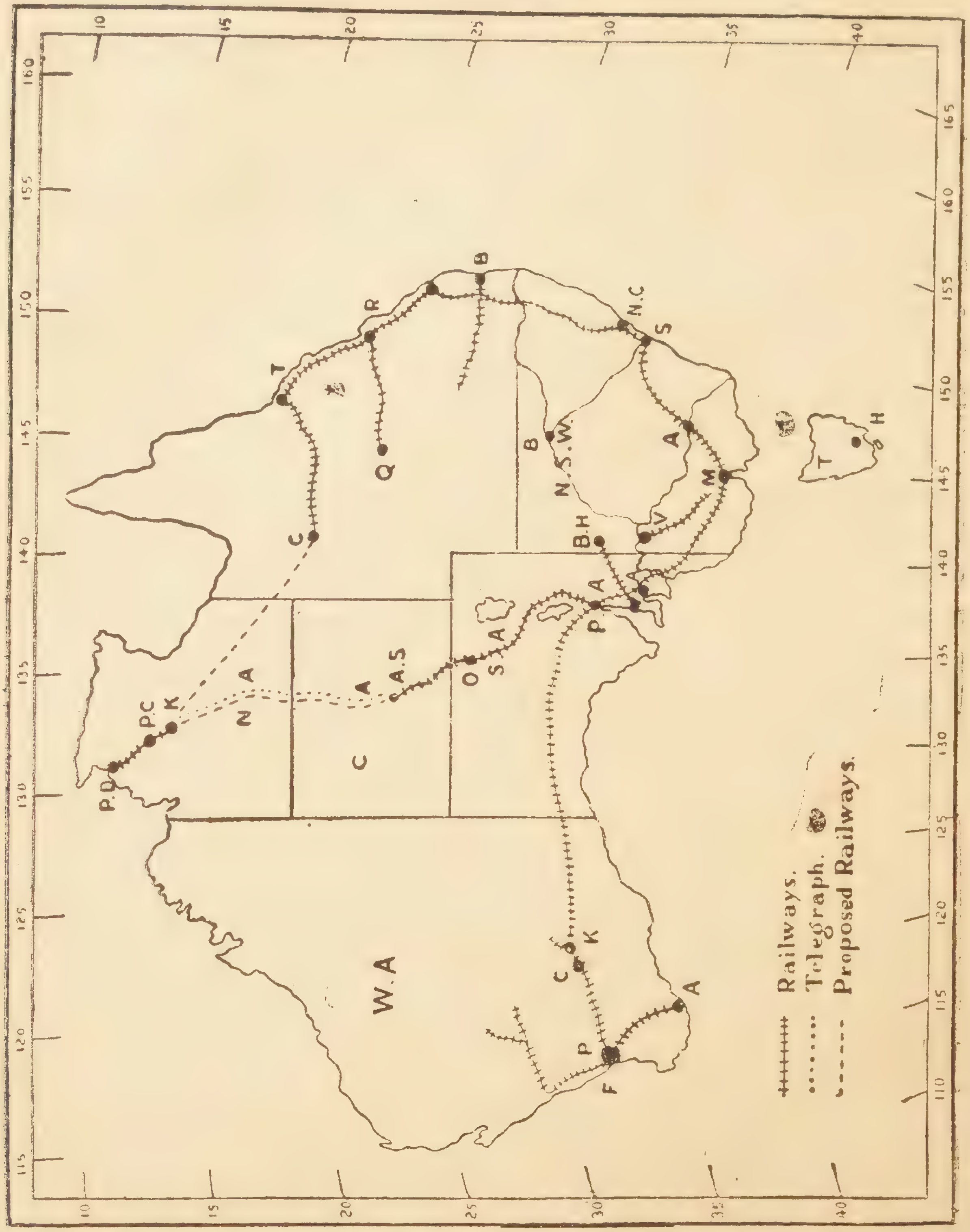


FIG. 15. POLITICAL DIVISIONS AND RAILWAYS.

W. A. West Australia
N. S. W. New South Wales
N. A. North Australia
V. Victoria
Q. Queensland
S. A. South Australia
C. A. Central Australia

The line from Kalgoorlie to Port Augusta is now completed and it is of the standard gauge (4' 8½").

The seat of the Federal Government is at *Canberra* in the *Federal Territory* (in N. S. Wales) situated on the main railway line between Sydney and Melbourne with a port at *Jervis Bay.* (Compare Delhi). The new Parliament House was opened in May 1927. The powers of the Federal Government are chiefly confined to affairs that are common to all the states, *e.g.*, taxes and customs duties, naval and military defence, and postal arrangements. The Federal Government administers directly the Northern Territory which has recently been divided into North Australia (Capital, *Darwin*) and Central Australia (Capital, *Alice Springs*), the 20th parallel of latitude being the dividing line. Papua (British New Guinea) is administered by the Commonwealth Government.

Note that the boundaries of all the states of Australia follow arbitrary lines determined by latitude and longitude except the River Murray, the boundary of Victoria and New South Wales, and the River Darling which forms part of the southern boundary of Queensland.

PEOPLE AND POPULATION

The population of Australia, as we have seen, consists mainly of British immigrants and their descendants. They form 97% of the total population. Besides the 60,000 natives found in the desert margins, there are some Chinese in the north and north-east coast. The Government of Australia has decided to make it as far as possible a white-man's continent. The Australians want to keep out 'coloured' labour for political reasons. They want to preserve the purity of the white race, which they think would be lowered by intermixture with Asiatic blood. If coloured labour is employed, the less efficient of the white men will have no respectable livelihood left; for coloured people will work for very low wages. Therefore the Government has restricted immigrants to those of European origin. This is known as the *White Australia policy*. The Kanakas who had been imported from the Pacific islands to work on the sugar plantations of Queensland are now being sent away.

Density of population depends chiefly on the occupation of the people, which again depends upon the physical and climatic conditions of the place. In the dry interior the *desert* is uninhabited as there is no food supply. (Note the desert of Australia has no oases as the Sahara has.) In the *forests*, where hunting would be the natural occupation, food is soon exhausted and so the population is very thin. In *pastoral areas*, where food supply is increased by breeding animals, population is somewhat greater. In *agricultural* areas, where food supply is considerably increased by cultivation, the population is denser. Further the space required for cultivation is much less than that required for pasturing. In *mining and manufacturing areas and commercial centres*, where food can be imported from outside, population is densest. Study the density of population map (Fig. 16). Note the population of Australia is confined to the coastal margins of the south-west, south, south-east and east where the climate is insular and rainfall sufficient and cultivation possible, and also to the mining centres in the interior. The north coast is covered with hot and wet forests and therefore unsuitable for white settlement.

The total area of the Commonwealth is nearly 3 million square miles and its population is only 6½ millions, the average *density* being 2 persons per square mile. (Compare this with the density in British India : 256 per sq. mile.) As the bulk of the population consists of European (chiefly British) immigrants it is concentrated in the coastal lands of Victoria, Tasmania and New South Wales, where the climate is suited to white settlement. Half the population of each state is concentrated in its capital city. The thin population of Australia is due not only to the climatic conditions of the dry interior and tropical north, but also to the White Australia Policy. It is estimated that 15 per cent of the total area contains practically the whole of the population (6 millions). In 1851 the population was less than half a million and it has been steadily increasing all these years. With the development of manufactures and

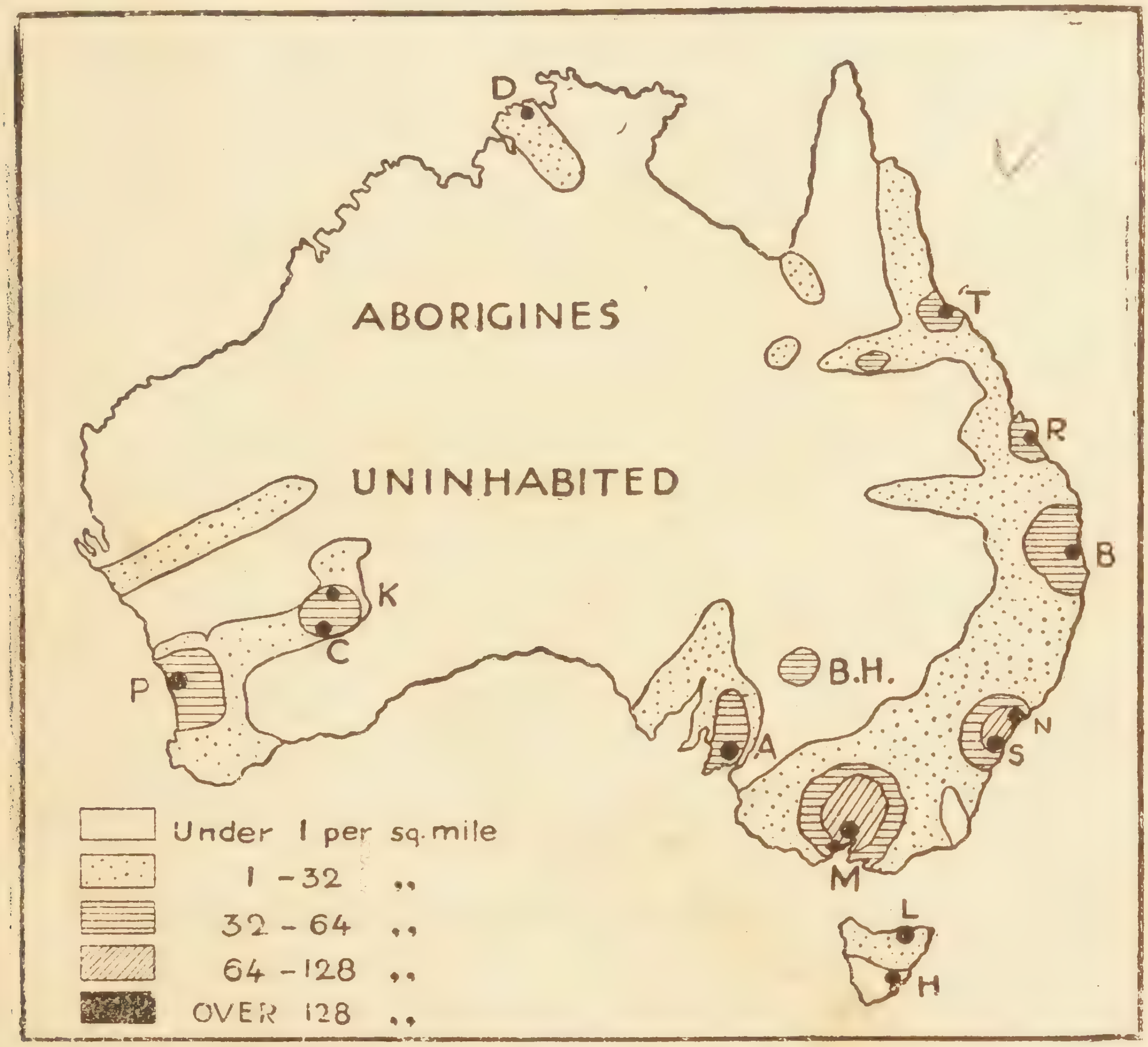


FIG. 16. Density of Population.

"with the development of agriculture over the vast areas now untouched, the continent could support a population many times as great as that of the present day." There are no *poor* people in Australia, and the standard of living is much higher than in most countries.

The following table gives the area and population of the states of Australia :—

States.	Area in sq. miles.	Population.	Density : No. of people per sq. mile.
New South Wales ...	310,367	2,370,623	7·5
Victoria ...	87,884	1,726,445	19·5
Queensland ...	670,500	894,444	1·2
South Australia ...	380,070	570,900	1·5
West Australia ...	975,920	385,043	0·4
Tasmania ...	26,215	208,179	7·9
Northern Territory ...	523,620	4,260	0·07
Federal Territory ...	940	7,535	8·0

PRODUCTIONS AND INDUSTRIES

Most of the people of Australia are engaged in some form of *primary production*—agriculture, sheep farming, cattle and horse rearing, fruit farming, dairying, mining and forestry. When the first settlers came to Australia, they found no grains, fruits or vegetables that could be cultivated for food. Wheat, maize, the vine, fig and other fruits have been introduced successfully. They are all grown in such large quantities that they now form articles of export.

Agriculture : Agricultural lands are mainly along the east coast where there is a good supply of rain. In the

Murray basin where the soil is good and water can be supplied by irrigation there is a large tract of agricultural land. *Wheat* is largely grown in N. S. Wales, Victoria, and S. Australia. This requires a warm dry summer to ripen it and does not need heavy rainfall. *Maize* is grown in the tropical shores of Queensland, and is used largely for the feeding of animals. The hot climate and monsoon rains of Queensland make it fit for *plantations. Sugar cane* and *cotton* are extensively grown.

Fruit-farming: This has become an important industry. In the "Mediterranean" regions in the south and south-west *vine* is cultivated. Hence wines, raisins (dried grapes) and currants are exported from South Australia and Victoria. These regions have a dry summer and so are suited to the growth of fruit trees. Tasmania is noted for *apples.* In the tropical coastlands of Queensland tropical fruits like *bananas* and *pineapples* are grown. On the coast of New South Wales *oranges* and *lemons* thrive well.

Pastoral Industries: *Sheep farming* is by far the largest industry of Australia. Sheep breeding is most profitably carried on in regions where the rainfall is between 10 and 20 inches in the year and the mean annual temperature is not more than 76° F. Such a condition obtains in the lowlands to the west of the Eastern Highlands. New South Wales has the largest number of the best breeds of *merino,* which yield the best wool in the world. They are found in the western slopes of the state. The merino has been introduced from Spain. Other breeds more suitable for mutton are found in the wetter eastern slopes.

Cattle Rearing: Cattle require a richer pasture-land than sheep. Hence they thrive well on the coastal lands in the east and on the savannahs of the north. Good *beef producing* cattle are raised on the tropical grasslands of Queensland and the Northern Territory. In the cooler lands of N. S. Wales and Victoria dairy-farming is more important.

The following table shows the distribution of sheep and cattle (1926):—

States.	No. of sheep.	No. of cattle.
	Millions.	Millions.
New S. Wales	53·9	2·9
Victoria	14·9	1·4
Queensland	16·9	5·5
South Australia	7·3	0·3
West Australia	7·5	0·8
Tasmania	1·6	0·2
Northern Territory	0·08	1·0

Wool-packing, meat-freezing, wine-making, fruit-canning and making of cheese, butter and condensed milk are some of the industries connected with the *primary* productions.

Mining: Australia, being one of the oldest continents, is rich in minerals. It was the discovery of gold in New South Wales and Victoria that caused people to rush to Australia. Now agricultural and pastoral products are more valuable than mineral. *Gold* is largely found in the highlands of Queensland, in Victoria and in western Australia (Vide fig. 17 and 19). The famous fields of *Coolgardie* and *Kalgoorlie* are in a dry region with a mean annual rainfall of less than 9 inches. Therefore water has to be elevated by nine pumping stations from near Perth over a height of 1313 ft. to a reservoir, and from there it has to be conducted by pipes to the mining settlements. At Kalgoorlie, 375 miles from Perth, water costs 7 shillings per 1000 gallons. Valuable *Coal* is mined in the Hunter valley of N. S. Wales. *Iron* is also found near coal. Some coal is also found in Queensland, Victoria and Western Australia. *Silver*, *lead* and *zinc* are mined at Broken Hill in N. S. Wales, *tin* in Queensland, *copper* in S. Australia and N. S. Wales. Tasmania has copper, tin, silver and also some gold.

Manufactures: Rich supplies of raw materials (wool, hides and tan bark) together with the coal and iron deposits have caused the people to manufacture goods for home use. The chief manufactures are *textiles* at Melbourne, Geelong and Ipswich; *leather* at Geelong; *steel* and *machinery* at Sydney, Newcastle and Lithgow; and *ship-building* at Sydney. But these manufactures are insufficient to meet the requirements of the Commonwealth. Hence a large quantity of manufactured articles has to be imported from industrial countries.

COMMUNICATIONS

The development of a continent depends upon easy means of transport by which goods can be taken to the market, *viz.*, roads, railways and rivers. In a '*new*' continent like Australia roads cannot play any important part. The Murray, the only big river, is not very useful for navigation; so the development of Australia depends mainly upon its railways (Fig. 15). As there are highlands behind the coast these railways run parallel to the coast with branch lines going through gaps to the mining and pastoral centres in the interior.

Again, they are found only in the south and along the east coast as these are the places that are somewhat densely peopled; for the central region is desert and the north is forested. The recently-completed trans-continental railway runs from Perth in W. Australia to Port Augusta in S. Australia and thence to the other towns in the East. This saves time in the delivery of mails to the Eastern States. One can now travel from Perth by Adelaide, Melbourne, Sydney and Brisbane to Longreach in Queensland, a distance of nearly 4,000 miles; but, as there is a frequent change of gauge between the different states, the journey becomes tedious and the time taken is doubled. It now takes six days to reach Brisbane from Perth. The gauge in use in N. S. Wales is 4' 8½"; in Victoria, 5' 3"; in Queensland, S. Australia and Western Australia, 3' 6". It has now been decided to change all the main lines to the 4' 8½" gauge (the Standard Gauge).

Another trans-continental line that is partly completed is between Port Augusta in the south and Port Darwin in the north. *The Overland Telegraph Route* (1,973 miles) between the two towns is connected by sub-marine cable with Singapore and Madras. The railway follows the telegraph route. It has been taken northward from Port Augusta to Alice Springs in Central Australia, and from Darwin it runs southward to a place south of Pine Creek.

Beyond the region of railways *Motor Coaches* enable travellers to reach the country districts. Long distance *Aerial Mail Services* have been established in Western Australia, in Queensland, and from Adelaide to Brisbane *via* Sydney. *Wireless* telegraphy stations are in operation in all the state capitals. Even isolated settlers learn the news of the day by wireless broadcasting.

For inter-state trade, steamship services are maintained regularly from port to port on the western, southern and eastern coastlines.

The navigation of the Murray is now sought to be improved by erecting dams across it so that it may have sufficient water even in the dry season.

EXERCISES

(1) What is meant by a "Commonwealth"?

(2) Why are the boundaries of the states mainly "artificial"?

(3) In what respect does Canberra resemble Delhi?

(4) What is meant by the "White Australia policy"? How does this affect the population and development of Australia?

(5) Arrange the states in the order of (a) area, (b) total population, and (c) density of population. Draw a diagram to compare the population of the state capitals.

(6) Where is irrigation necessary? Have you any irrigation work in your place?

(7) Which state has the largest number of sheep and which the largest number of cattle? Why? Draw a diagram to show the percentage of sheep in each of the states.

(8) Draw a map showing the distribution of minerals in Australia.

(9) Name the chief industrial centres of Australia and state with reasons the nature of the industry carried on in each.

(10) Why is Australia poor in navigable rivers?

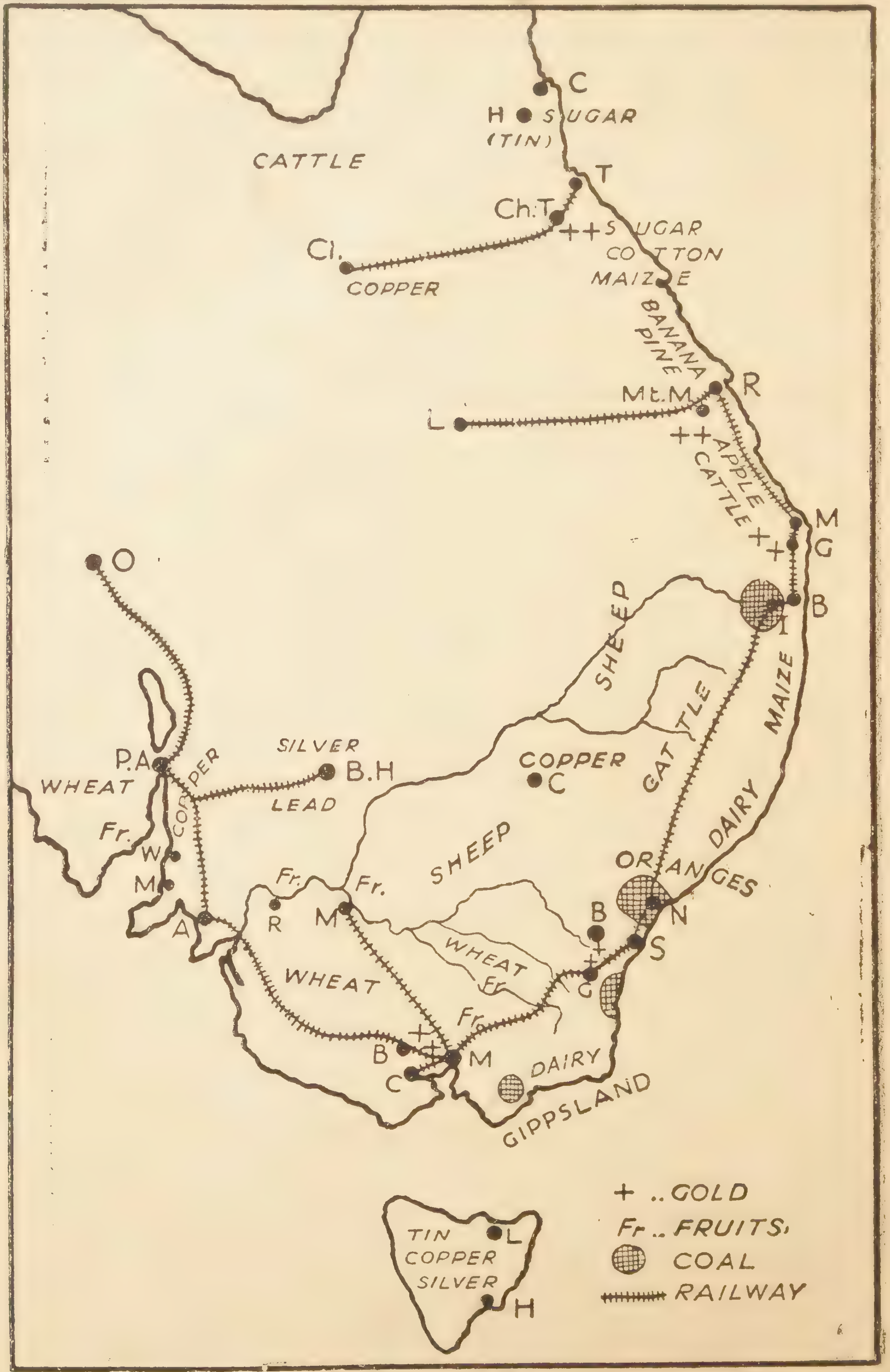


FIG. 17. Economic map of S. E. and East Australia.

CHAPTER V

LIFE AND WORK OF MAN IN SOME TYPICAL REGIONS OF AUSTRALIA

We have seen that the climatic conditions of the forested northern coastal lands, the savannahs further south, and the desert interior are unsuited to the white immigrants, and they have, therefore, settled only along the coastal lands in the southwest, south and east. Three regions have so far been developed ;

(i) *the East Coast Region* which has a good rainfall and small range of temperature ;

(ii) *the Temperate grasslands of the Murray-Darling Basin* where conditions are favourable for the pastoral and agricultural occupations ; and

(iii) *the "Mediterranean Regions"* of the south and south-west where temperature is mild and rainfall sufficient. Let us make a detaild study of these three regions.

THE EAST COAST REGION (Fig. 17)

The region falls into two divisions : (i) *the tropical north with rains in summer* and (ii) *the warm temperate south with rains distributed throughout the year.*

The climate of the north resembles that of South India and therefore tropical products of the Indian type are grown, *e.g.*, sugar, cotton, rice, bananas and maize. The slopes of the Highlands are covered with forests yielding valuable timber. The river valleys are devoted to *sugar-cane,* the chief centres being Mackay and Cairns. There is much land round the Gulf of Carpentaria which is suitable for the growth of *cane.* But it remains idle for want of suitable labour on account of the "White Australia" policy. However, the plantations on the east coast are now worked by white labour and the Government gives a *bounty* for cane grown wholly by white labour.

Besides sugar, tropical fruits like *bananas* and *pineapples* are grown in the alluvial plains. On the lower slopes of hills some *cotton* and *coffee* are grown, while on the higher slopes *maize* is cultivated. This is used as food for cattle.

The climate of the region is also suitable for the growth of cotton ; but the picking of cotton is such a laborious process that it cannot be profitably done without the use of cheap *coloured labour*, and therefore the future of cotton cultivation is doubtful.

The climate of the southern half of the east coastal belt is more favourable to European settlement than that of the northern half. Therefore, the coastal belt of New South Wales is better developed and supports a larger population. Sugar is grown in the north and maize in the south. The cultivation of sugar is now declining. The maize cultivated in N. S. Wales is not sufficient to feed the stock in the state and so much has to be brought from Queensland.

Fruit-growing is an important industry here also. Warm temperate fruits like *oranges* and *lemons* thrive well in the district round Sydney. *Paramatta* is famous for its oranges. Further south peaches and plums are grown.

Cattle and sheep are reared in large numbers. The wetter coastal lands are suitable to the cattle, and the drier and higher regions to the sheep. The cattle are bred for two purposes: (i) for beef and (ii) for dairying. In the tropical northern half they are reared for beef, but in the temperate coast of N. S. Wales *dairy farming* has become an important industry except in the area round Sydney.

Newcastle at the mouth of the *Hunter* is an important coal-mining centre. It is the largest coalfield in the Southern Hemisphere. Its coal is not only used for the railway and factories of Australia, but also exported to foreign countries, especially to the Pacific states of South America. South of Sydney there is another coalfield near Wollongong. In Queensland considerable quantities of coal are obtained near *Ipswich.*

In the highlands behind the coast, gold, tin and copper are mined. *Tin* is found at *Herberton* in the north; *gold* is mined at *Charter's Towers*, *Mount Morgan* and *Gympie*. Their outlets are *Townsville*, *Rockampton* and *Maryborough* respectively. *Cairns* is the outlet for the tin of Herberton. All the ports in the north-east are connected with the interior mining and farming centres by railways, and their harbours are made safe by the sheltering effect of the Great Barrier Reef.

Bathurst in N. S. Wales was formerly a gold mining town, but is now an important agricultural centre.

Owing to the presence of coal a few industries have grown up at Sydney and its neighbourhood. There is ship-building at Sydney. Iron and steel manufactures are carried on at Sydney, Newcastle and Lithgow. The steel works of Newcastle are also supplied with iron from Port Pirie in South Australia. Ipswich is noted for its cotton and woollen manufactures. Other industries are sugar refining in the north and dairy produce in the south. A great deal of power can be generated from the upper course of the streams in the Eastern Highlands which receive a steady supply of water from the rains distributed throughout the year. Except in Tasmania water power has not yet been used for the production of electricity in any of the States of Australia.

Brisbane, the chief port and capital of Queensland is situated about 20 miles from the mouth of the Brisbane river. Its harbour has to be kept deep by constant dredging, like the Hugli in India. It is connected by rail with the ports to the north and to the south and with the stock-lands in the west. As it is located on the south-east corner of the state and as the other ports have independent access to their own hinterlands, the trade of Brisbane is not so very important as that of other capital cities of the Commonwealth.

Sydney, the " Queen City of the South," the capital of New South Wales, stands on Port Jackson, an almost land-locked deep inlet with a narrow entrance, the finest harbour in the world. As it occupies a central position on the coast of New South Wales, it is the meeting point of the railways from the chief towns in the interior and along the coast. Its exports are representative of all the natural regions of the state. It is the first city in the commonwealth having a population of more than a million.

THE MURRAY-DARLING BASIN (Fig. 18)

This basin extends from the summit of the Eastern Highlands westwards up to the Flinders Range. The climate of this region is warm temperate with a high range of temperature (32°F), for it lies in the rainshadow area, and is therefore cut off from the influence of the sea. What is the range of temperature at Bourke which is about the middle of the basin ? Compare it with that of any town on the coast. Rainfall decreases from east to west from 30″ to 5″. Compare the rainfall of Bourke and Broken Hill. So much of the basin is grassland, the grass getting poorer from east to west.

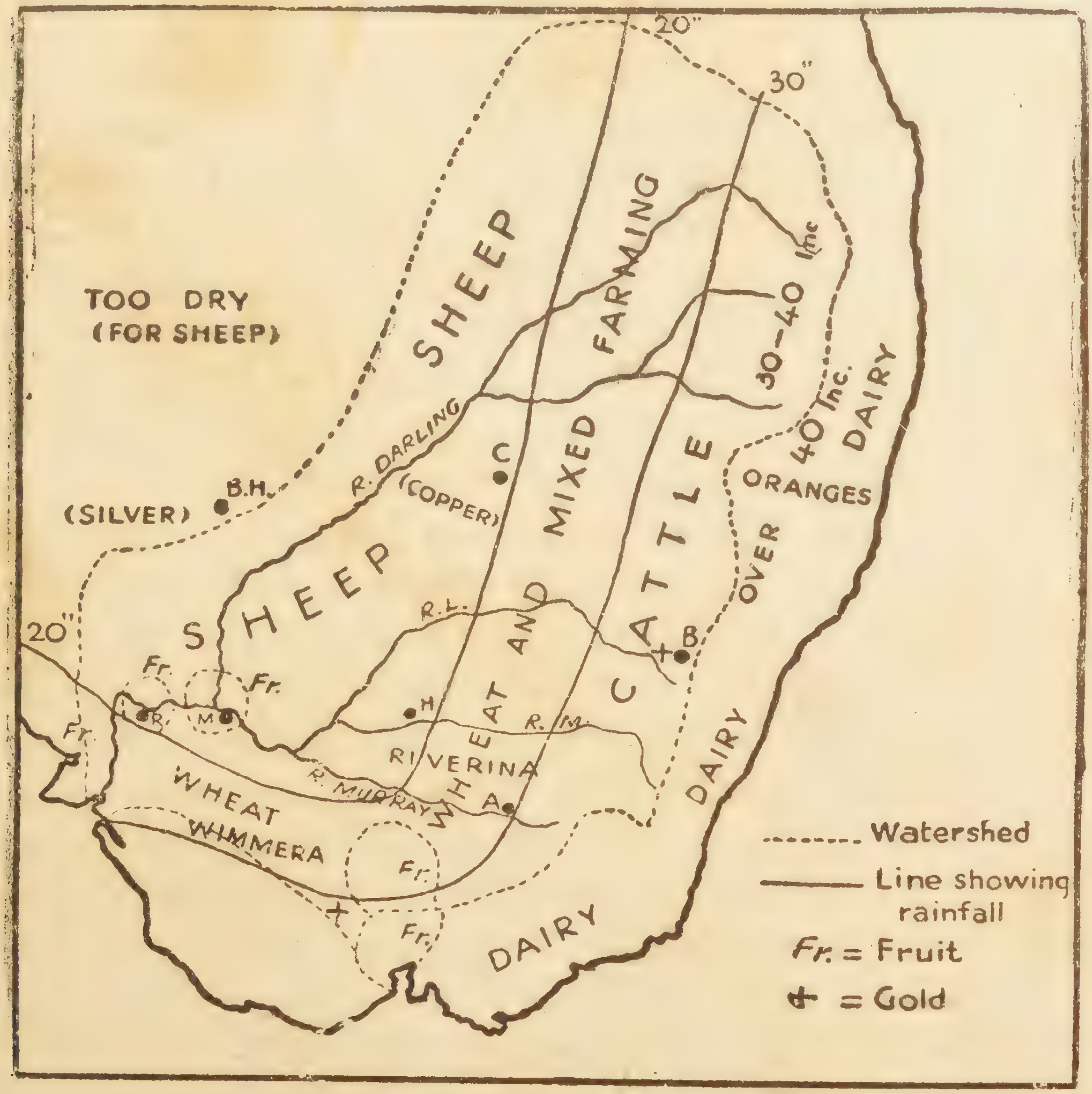


FIG. 18. The Murray-Darling Basin.

In the eastern portion of the basin where rainfall is between 20″ and 30″, the rich grasslands are used for *wheat growing* and *stock raising*. Cattle as well as sheep are reared here. Horses are also reared and large numbers of them are exported to India for the use of the cavalry. As these come from N. S. Wales, they are called '*Walers*'.

West of this belt where rainfall ranges from 10″ to 20″ *sheep farming* is the chief occupation. It forms one of the most important industries of Australia. The sheep which are of the *Merino* breed yield the finest wool in the world.

Where grass cannot grow, the 'salt bush' which can resist drought grows, and this is good for sheep. The most fertile part of the basin is the *Riverina* which lies between the Murray and the Murrumbidgee. In addition to sheep-farming, *wheat* was cultivated here in favourable seasons. But now it is the chief wheat growing area in Australia, as it has been brought under irrigation. Many of the small farmers are practising mixed farming: rearing sheep and raising agricultural crops.

Floods and *droughts* are two of the dangers the sheep farmer has to contend with. The effects of uncertain rainfall and drought are more serious than those of floods. Rivers shrink into muddy little pools and thousands of sheep perish from lack of water. This difficulty has now been removed by the building of dams across rivers and the sinking of many *artesian wells* which now furnish an unfailing supply at all seasons. Hundreds of these wells have been sunk in Queensland and New South Wales. The 'squatter' who has an artesian well on his 'run' no longer fears the horrors of drought.

Rabbits form another of the difficulties of the farmer. They were introduced as pets at first, but they soon multiplied so enormously as to become a real danger to the country. Ten rabbits will eat as much grass as a sheep. Though tens of thousands were destroyed at a time, they still continued to swarm. Large sums of money have been spent in putting up wire fences for hundreds of miles to keep them away from the pastures. New South Wales alone has 17,000 miles of wire fencing. This curse of Australia is now proving a blessing; for thousands of them are exported to all parts of the world as *frozen* rabbits. Their skins are used as *imitation fur.*

As rainfall is scanty and uncertain, agriculture can be carried on only by irrigation. In the north, water is supplied by artesian wells, and in the south and south-east, by rivers. The *Wimmera* district forming the North-Western portion of Victoria is one of the rich irrigated areas, and supplies nine-tenths of the wheat of the State. The *Goulburn Weir* in Victoria has been irrigating many orchards. At *Mildura* water is pumped from the Murray, and peaches, raisins, olives and citrus fruits are largely grown. The *Burrin Juck Dam* on the Murrumbidgee has a storage capacity second only to the Assuan Dam in the Nile. About 200,000 acres of first-class land can be irrigated by it. Locking the Murray R. is in progress; the river will then become navigable for 1000 miles and will irrigate extensive areas along its banks. The Riverina will be best watered by the Murray and Murrumbidgee irrigation schemes. Compare this with one of the '*Doabs*' of India.

The basin is not without mineral wealth. Copper is mined at Cobar, and silver, lead and zinc at Broken Hill. The latter is near the borders of S. Australia and so sends its minerals through Port Pirie on the Spencer Gulf.

THE MEDITERRANEAN WESTERN AUSTRALIA, SOUTH AUSTRALIA AND VICTORIA (Fig. 19)

We have seen that the south-west corner of Western

Australia south-eastern South Australia and Western Victoria have a dry summer and a wet winter, i.e., they have a "Mediterranean" climate.

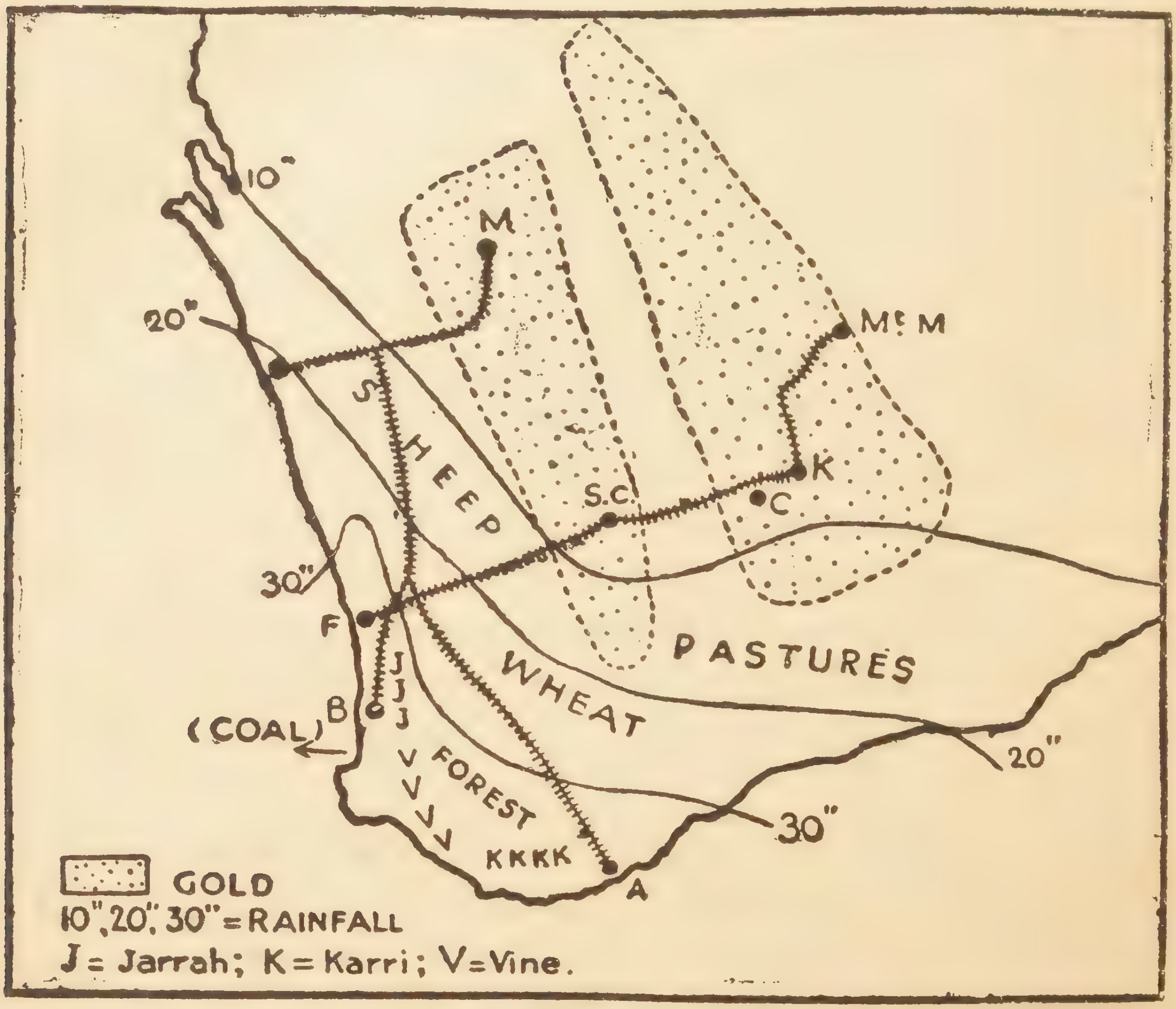


FIG. 19. Economic map of South Western Australia.

The south-west corner of Western Australia has three distinct belts. Near the coast there is a belt of forest which contains two of the important trees of the eucalyptus family. The *Jarrah*, one of the most handsome and durable timber trees, is used for street paving, and it makes excellent railway sleepers. The *Karri* grows to a height of 200 ft. and attains a diameter of 10 ft. at the base. It is strong and tough and is therefore well suited for use in building bridges and making shafts.

Behind the forest belt is the wheat area, and behind it lie the sheep pastures. As the dry summer is favourable for the growth of fruits, the vine and other Mediterranean fruits are cultivated near Perth. Western Australia is very rich in gold, and the gold fields of Coolgardie and Kalgoorlie have already been referred to. Some coal is found and is exported from *Bunbury*.

Perth, the capital of Western Australia, is situated 12 miles up the Swan River. It is connected by railway with *Geraldton* in the north, the port for the Murchison gold fields, and with *Albany* in the south-east, a naval coaling station. It is also connected with the Kalgoorlie gold fields in the east, from which runs the Trans-continental line to Adelaide and the east coast. *Fremantle*, the port of Perth, is the first port of call for steamers coming from Europe *via* Suez Canal and Colombo.

The remaining part of West Australia except the north-west which has some rain in summer is largely desert or semi-desert.

Look at the population map. Which is the inhabited part of South Australia? You will find most of the inhabitants living in the lands surrounding the Spencer and St. Vincent Gulfs. This land forms the "Mediterranean" region of South Australia. The climate is suitable for fruits, and many vineyards and fruit gardens have been planted on the sunny northern slopes of the hills. Wheat is cultivated on the coastal plains surrounding the two great gulfs. South Australia is the chief exporter of wine, currants and raisins in the Commonwealth. The land behind the coastal plain is scrub and fit only for pasturing. The land east of the South Australian Highlands is given over to pastoral occupations. Why? At *Renmark* on the lower Murray, Mediterranean fruits are cultivated as at Mildura in Victoria.

South Australia, though less rich in minerals than any other state, has valuable *copper* mines at *Wallaroo* and *Moonta.* Port Pirie is the port and smelting centre for the rich ores carried by rail from Broken Hill in N. S. Wales.

Adelaide, the capital of South Australia, is situated on the east coast of St. Vincent Gulf six miles inland. Its port is *Port Adelaide.* The city is in direct communication by rail with Melbourne and other cities in the east and Perth in the west.

Port Augusta at the head of Spencer Gulf is an important railway junction on the trans-continental railway. but its trade is very small.

The over-land telegraph route and the projected trans-continental railway from Port Augusta to Darwin on the north coast have already been referred to. (*Vide* Communications, Chapt. IV.)

Refer to the population map again, and find out the most densely peopled state of Australia. It is Victoria. This is due to the cool temperature, abundant rainfall and the natural resources of the state.

The cultivation of wheat in the *Wimmera* district in the north-west, which was once covered with mallee scrub and which is now irrigated, as well as the fruit cultivation round *Mildura* have already been referred to. Vine and other Mediterranean fruits are also grown on the sunny northern slopes of the mountains. Hence wine, currants, raisins and other dried fruits form important exports.

In the highland belt *gold* is mined at *Ballarat* and *Bendigo,* but in recent years the output has declined.

Near the coast the Otway and Gippsland Hills are forested. Much of the Gippsland forests has been cleared and European grasses have been introduced. Hence it is noted for dairy farming. Some inferior coal is found here.

Between the high lands in the north and the coastal hills lies the Great Valley. Its western portion is part of the "Mediterranean" region and is therefore suitable for the fruit industry, while the eastern half is entirely pastoral.

Of the exports of Victoria, wool and dairy produce are the most valuable; the others in the order of importance are agricultural products; wheat, wine and fruits, and minerals, mainly gold.

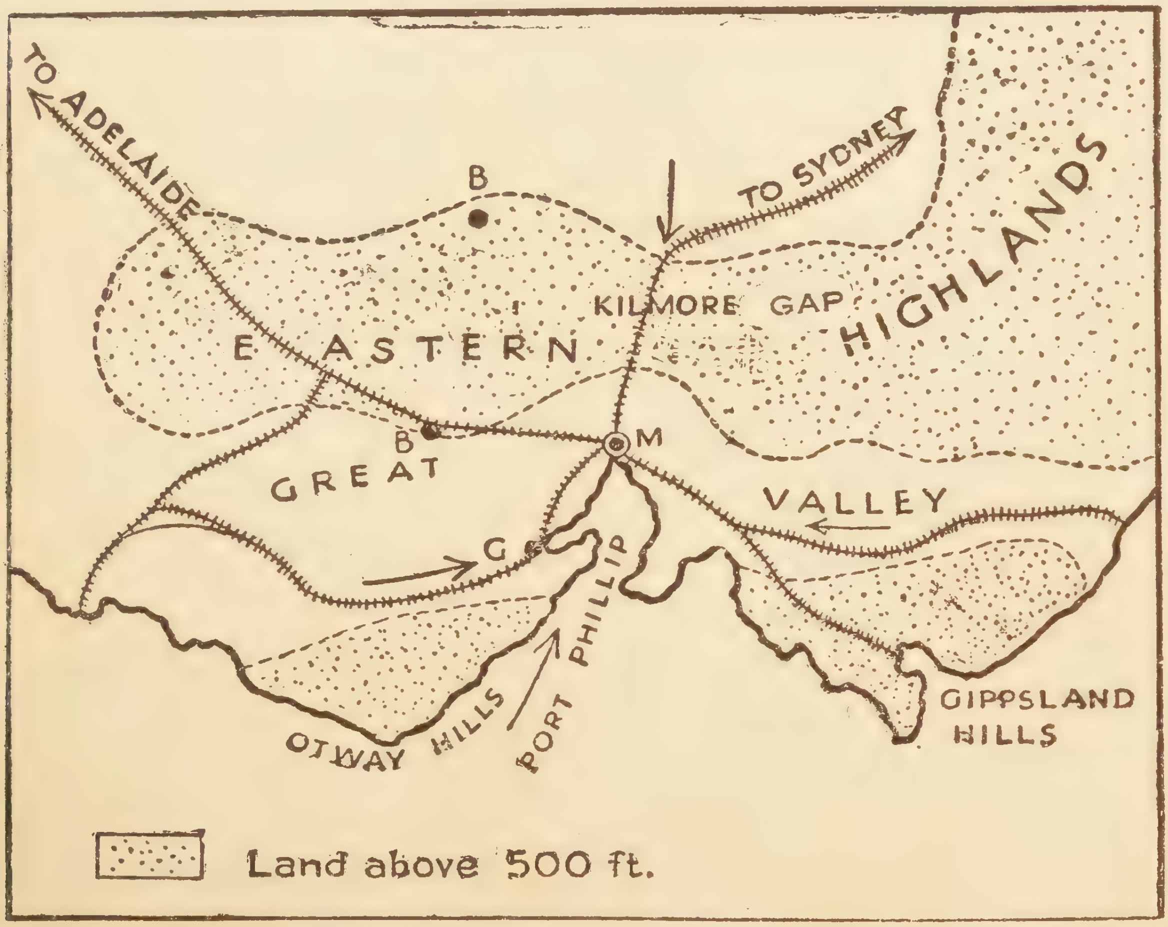


FIG. 20. Position of Melbourne.

The chief port and capital of Victoria is *Melbourne* (Fig. 20). It occupies a magnificent position at the head of the land-locked harbour of Port Phillip and commands the Kilmore Gap in the highlands behind. Railways from the interior reach the city through this gap. Railways from Adelaide, Broken Hill, Mildura, Sydney all converge on Melbourne and make it the outlet for the products of the various natural regions. It has a population of more than 900,000 and is the second city in Australia. *Geelong*, also on Port Phillip, is the second port and has woollen manufactures.

Tasmania, on account of its cool temperate climate, is also suitable for white settlement. It is rich in minerals; copper, tin, lead, silver and gold being the chief, and timber in mountain forests. Fruit-growing is extensively carried on in the drier south-east and large quantities of fruits, especially apples, are exported. The drier parts are also noted for sheep-rearing. *Hobart* is the capital and *Launceston* the chief port. The latter owes its importance to its nearness to Melbourne.

EXERCISES

(1) What regions are taken up for detailed study and why?

(2) Draw a map of Australia and insert all the towns mentioned in this chapter.

(3) Why has New South Wales a denser population than Queensland?

(4) Mention the chief occupations of the people along the east coast.

(5) What circumstances would lead to a greater development of Queensland?

(6) Give an account of river irrigation in Australia.

(7) Why is the trade of Brisbane not so very dominating as that of Sydney?

(8) What towns carry on iron and steel manufactures? Why?

(9) Which is the outlet for the minerals of Broken Hill? Why?

(10) Draw a diagram to explain the importance of the situation of Melbourne.

(11) Which is the largest sheep-rearing region? Why?

(12) Wine is one of the chief exports of the 'Mediterranean' region? Why?

(13) Trace the overland telegraph route.

(14) The south coast of Victoria has rain throughout the year. Why?

(15) Write short notes on: "Riverina", "salt bush", "Gippsland", "bounty."

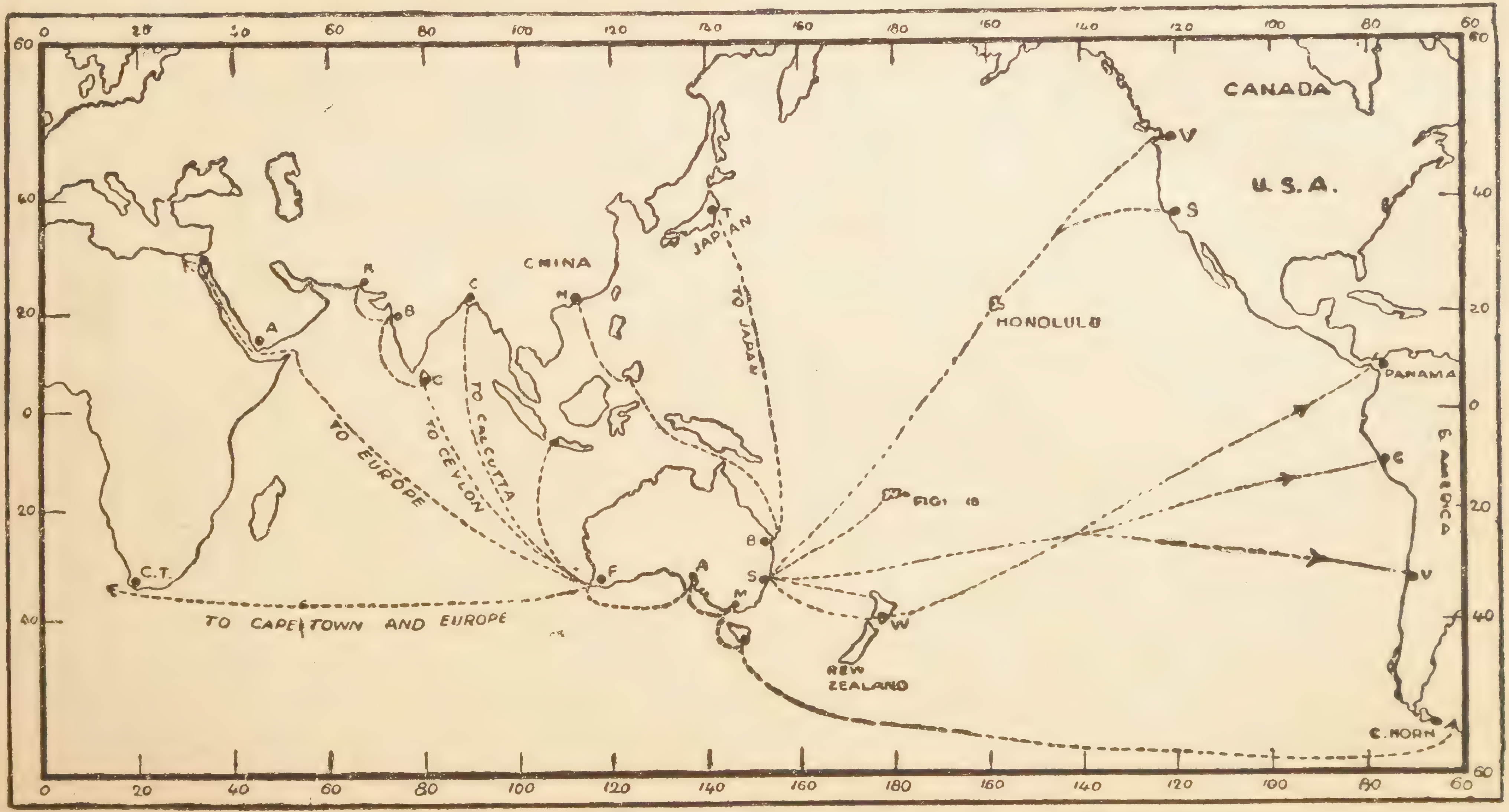


Fig. 21. Favourable Position of Australia for Foreign Trade.

CHAPTER VI

POSITION OF AUSTRALIA WITH REFERENCE TO FOREIGN TRADE

We have seen that the chief drawback in the position of Australia is its remoteness from great Britain and other industrial and commercial countries. This remoteness is illustrated by the following figures :—

Distance from London to Melbourne
via the Cape is 11,900 miles
,, ,, ,,
via Suez Canal is 11,300 miles.
,, ,, to Sydney
via Panama Canal is 12,550 miles.
,, from New York to Sydney
via Panama Canal is 9,800 miles.
,, San Francisco to Sydney is 6,500 miles.

Before steamships came into use sailing vessels from England to Australia took months to accomplish their voyage round the Cape of Good Hope. Vessels sailing to Australia went by the Cape route, and those returning to England took the Cape Horn route, for they had the advantage of the 'brave' west winds.

With the beginning of steamship service and with the opening the Suez Canal in 1869 and the Panama Canal in 1914, Australia has been brought nearer to England, and the journey at the present time takes about six or seven weeks. Now ocean traffic is carried on by steamships called "Liners" (passing along fixed routes or lines) which sail at regular intervals from one large port to another. Liners from England passing through these three sea routes reach Australia. Owing to regular steamship service Australia's position is now favourable for trade with the lands around the Pacific and Indian Oceans (Fig. 21). It trades with S. Africa, India, Ceylon and Java around the Indian Ocean; and with New Zealand, Fiji Islands, China, Japan, North America and South America in and around the Pacific Ocean. The great ocean routes from Europe and Africa (the Suez and Cape routes) touch Western Australia at Fremantle first. Owing to the high charges levied on goods and passengers in the Suez Canal, many vessels find it cheaper to take the longer Cape route.

Before the construction of the Panama Canal, all the trade between Europe and New Zealand passed through Australia, but now more than half the trade passes directly through the Panama Canal. Since the distance between Europe and Australia *via* the Suez Canal is shorter than that *via* the Panama Canal, trade between the two countries will continue to flow through the former route. Again the Suez route has another advantage. It passes through a greater number of coaling stations and productive countries on the way.

Australia is not industrially developed; so it sends out raw products and imports manufactured articles, About half the trade of the country is with Great Britain. Australia is rich in minerals, and so gold, copper, silver and lead are exported. The *Mediterra-*

nean Region exports wine and tinned fruits. The fruits of this area ripen in the southern summer when it is winter in Europe, and so can command a good price in the European markets. The grass-lands produce large quantities of wool, meat, hides and wheat ; and all these are exported ; but *wool forms the largest export.* Manufactured articles are imported also from the United States and Japan. Why ?

The following table shows the exports and imports of Australia in 1926-27 with their approximate values :—

Imports.	Value in million £	Exports.	Value in million £
Machinery & Metal goods...	15·2	Wool	60·1
Motor Cars ...	14·2	Wheat and flour ...	27·0
Cotton & linen goods...	10·0	Gold ...	11·4
Silk goods ...	7·8	Skins, hides, leather, etc	10·5
Petroleum, etc. ...	6·7	Butter, cheese, etc. ...	6·7
Paper & Stationery ...	6·0	Lead, Silver & Zinc ...	5·7
Rubber & Rubber Manufactures...	5·1	Beef & Mutton ...	5·2
Drugs & Chemicals ...	5·0	Fruits (dried, fresh and preserved) ...	2·7
Bags & Sacks ...	4·3	Timber ...	1·7
Tea ...	3·9	Sugar ...	1·7
Timber ...	3·6	Coal ...	1·0
Woollen goods ...	3·0	Other articles ...	14·9
Other articles ...	66·8		

From this we see that the exports consist of raw products—pastoral, agricultural and mineral ; and the imports consist chiefly of manufactured articles.

The following table shows the principal countries with which Australia trades and the approximate value of the imports from, and exports to, those countries (1926-27):—

Countries.		Imports Million £	Exports Million £
Great Britain	...	65·9	61·6
United States	...	37·2	13·0
New Zealand	...	2·6	5·0
Belgium	...	0·8	6·2
France	...	3·8	18·6
Japan	...	4·4	11·0
Union of S. Africa	...	0·9	2·2
Java (Dutch E. Indies)	...	6·2	2·2
India	...	6·6	3·4
Other Countries	...	23·2	25·4

This shows that the bulk of the trade of the continent is with Great Britain. What percentage of the total is it?

Throughout the commonwealth uniform customs duties are imposed and all inter-state trade is free.

A *preferential rate* applies to goods produced in and shipped from the British Isles and from other parts of the British Empire, *i.e.*, they are taxed at a lower rate than those coming from outside the Empire.

All the British countries taken together supply nearly two-thirds of the imports and purchase nearly three-fifths of the exports. Australia sends to Great Britain wool, butter, wheat, frozen meat, mutton and lamb, cheese, flour, fruits, hides, skins, tallow, leather, copper, lead and zinc, and in return gets apparel, textiles, machinery, motor cars, china and earthenware, paper and stationery, drugs and chemicals, and ships. From India Australia is supplied with rice, tea, linseed, spices and sacks and coarse sacking cloth that are needed for packing purposes.

In return horses, gold, silver and preserved meat are exported to India. Since India is also a producer of primary products, it sends only raw materials (except sacks) to the Commonwealth. Of the foreign trade of the Commonwealth in one year New South Wales had 40 per cent, Victoria 31 per cent, Queensland 11 per cent, South Australia 10 per cent, and West Australia 7 per cent. From this we can gather that Sydney (capital of N. S. Wales) and Melbourne (capital of Victoria) take up nearly three-fourths of the total trade.

The isolation of Australia is ever-lessening owing to the introduction of the cable and wireless. The next development will be an air service from England to Australia. The flight to Australia and back was successfully accomplished in 1926 by Sir Allan Cobham. There is now a regular air mail service between London and India. If this is continued to Australia across the Dutch East Indies it will be possible to shorten the transit of a letter to Australia by a fortnight and thus bring the Commonwealth nearer to Great Britain. In fact, an attempt is being made in this direction.

EXERCISES

(1) Draw diagrams to show the comparative values of the exports and imports of Australia.

(2) Mention all the sea routes by which one can reach Australia from England. Which is the shortest?

(3) Why do some vessels prefer the Cape route to the Suez route?

(4) What do you learn about the trade of Australia from the list of exports and imports?

(5) With what country does Australia trade most? Why?

(6) What is the nature of the trade between Australia and India? Give reasons for your answer.

(7) What possibilities are there for the future development of Australia? What changes are likely to take place in its exports and imports?

(8) Explain the term "preferential rate."

* * *

PART II

AFRICA

AFRICA

CHAPTER I

POSITION AND RELIEF

The 'Four Hinges': AFRICA is a vast peninsula united to Asia by the narrow Isthmus of Suez which has now been cut through by a canal. It is separated from Europe by the Mediterranean sea, but approaches it closely at two points: (1) the Strait of Gibralter (9 miles wide) and (2) the Sicilian Straits between Cape Bon and Sicily (Fig. 1). These with the Isthmus of Suez and the Strait of Babel-mandeb form, as it were, "the four hinges by which Africa is connected with Eurasia."

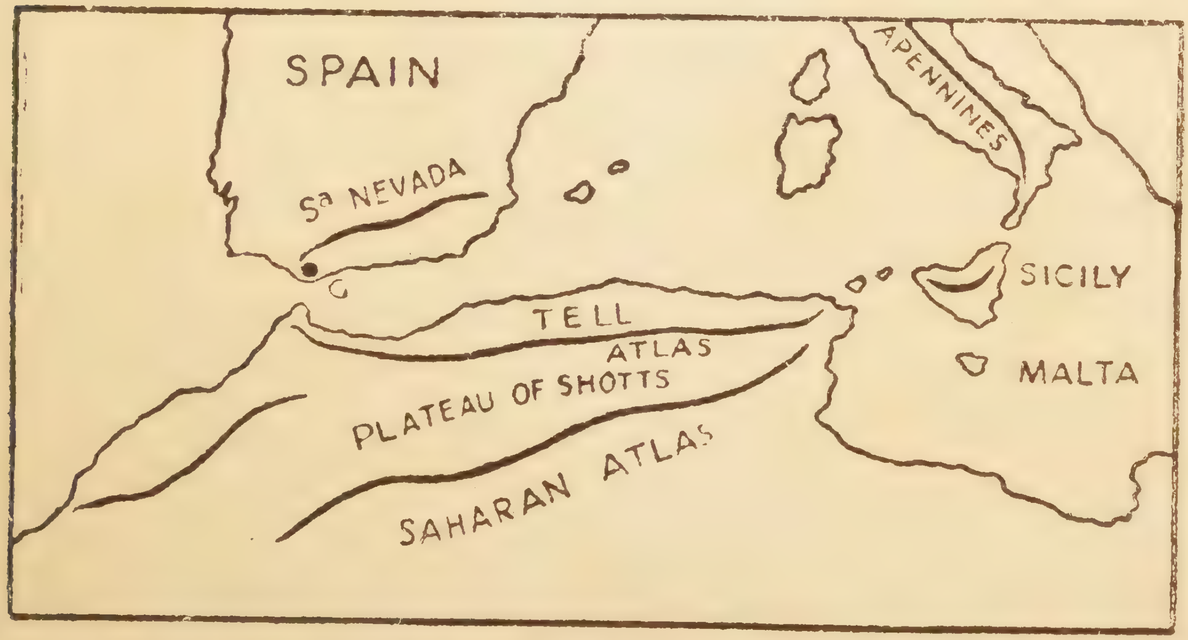


FIG. 1. North Africa showing former connection with Europe.

POSITION AND SIZE

Position and Boundaries: Africa lies between 37° N. and 34° S. latitude and, where it is broadest, it extends from 15° W. to 52° E. longitude. Find the greatest length and breadth of the continent in miles. Which part of Africa is in the same latitude as Australia ?

The equator passes right through the middle of the continent so that nearly three-fourths of it lie in the torrid zone. The portion north of the equator is twice as broad as that south of it. Find from your atlas what oceans bound the continent on the west, south and east.

Size: Africa is the second largest continent in the world, its area being $11\frac{1}{2}$ million square miles. It is roughly four times the size of Australia, six times that of India, and two-thirds that of Asia.

COAST-LINE AND ISLANDS

Africa, like Australia, is a compact land mass with no large openings or seas penetrating into the land. In this respect it is a contrast to Europe. The *Gulfs of Sidra* and *Cabes* in the north are shallow openings. The *Bights of Benin* and *Biafra*, forming part of the *Gulf of Guinea,* are useless as harbours. The *Delagoa* and *Algoa Bays* in the south are of some importance.

Look at the 100 fathom line in Fig. 2. It is very close to the coast so that the continental shelf is very narrow. Which islands along the east coast of Africa lie on the continental shelf? The narrow continental shelf and the unbroken coast are due to the build of the continent.

The large island of *Madagascar* lying off the east coast was once joined to the mainland, but is now separated by the *Mozambique Channel* which is nearly two miles deep. It is a *continental island* as it has the same physical features as the East African Plateau; but the separation must have been effected in long-past ages; for many of the large animals found on the mainland are absent in the island. The small islands and island groups in the Atlantic ocean are of volcanic origin. Find out these islands from

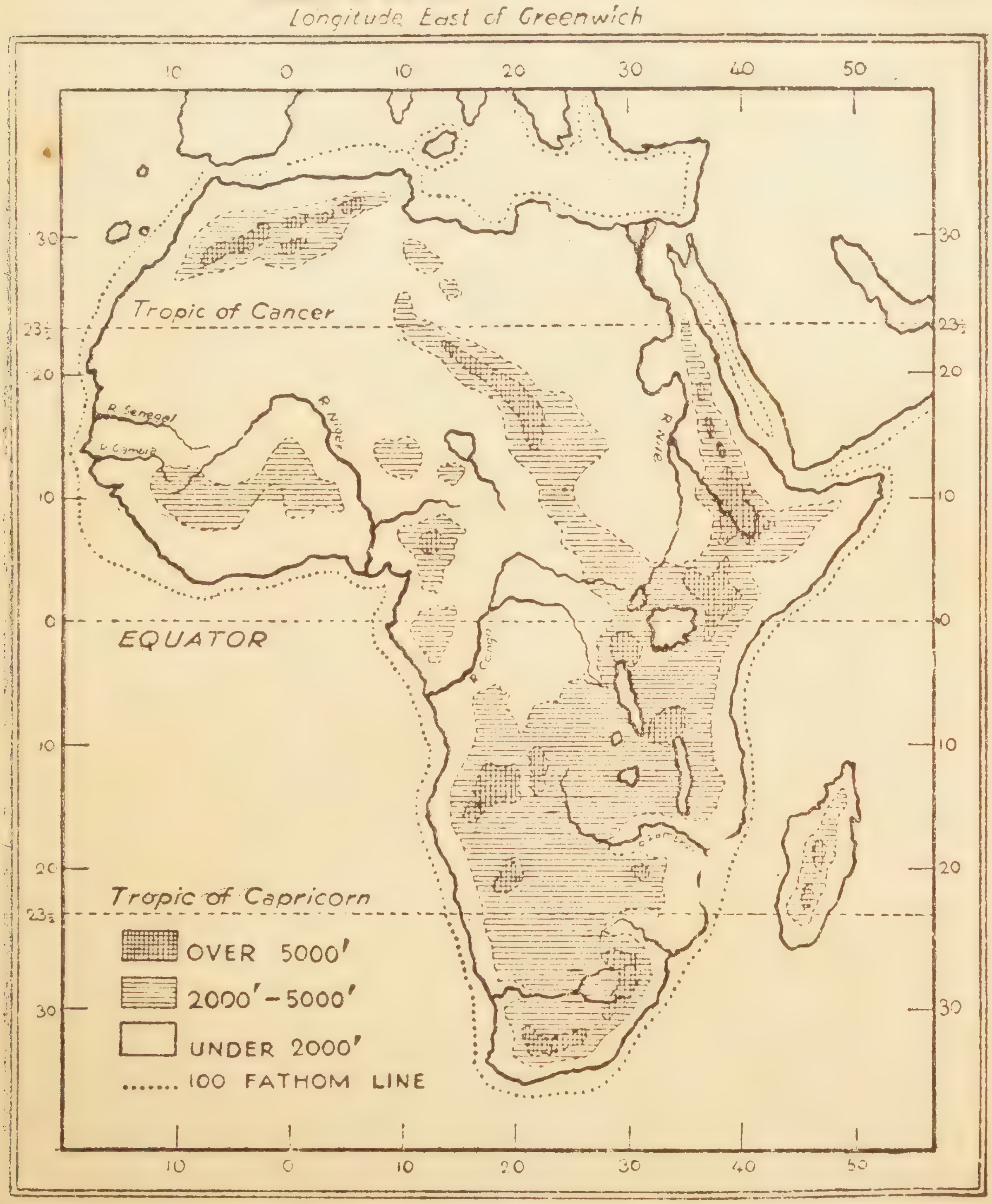


FIG. 2. AFRICA: Relief.

your atlas. Such islands as do not have the same structure as the mainland are called *oceanic islands.*

STRUCTURE AND RELIEF

An Enormous Plateau: Africa is almost entirely an enormous plateau like the Deccan or Western Australia, but much larger in area. This plateau is supposed to be part of a much older continent which stretched across the southern hemisphere and included the plateaus of Brazil, the Deccan and Western Australia. The island of Madagascar is a remnant of the ancient continent. The oceans separating all these plateau masses have been formed by the faulting and sinking of land. It is this 'faulting' or cracking (Fig. 3) that accounts for the *regularity of the coast* of Africa. Thus Africa is one of the old blocks (Fig. 4) of the earth's crust.

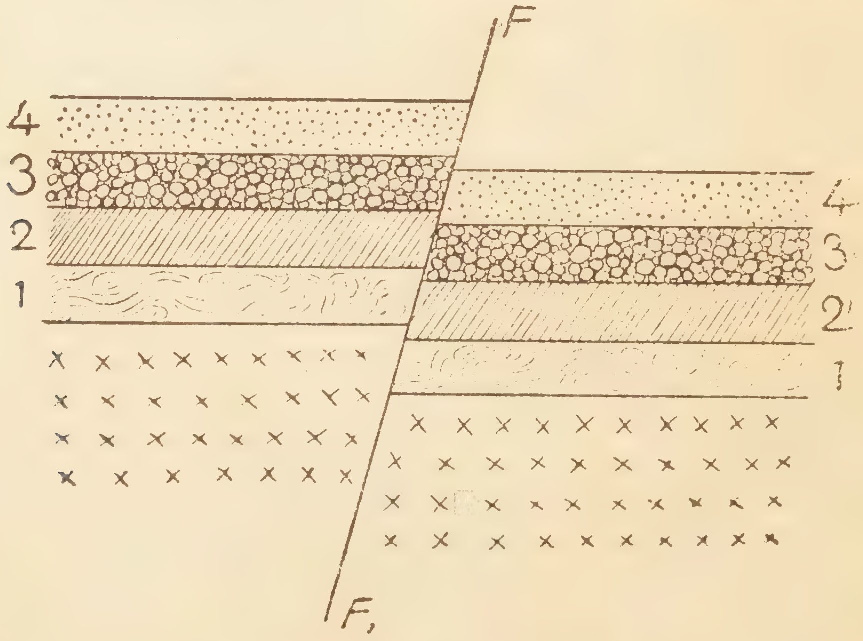


FIG. 3. FAULTING

F F 1 is the line of faulting. 1, 2, 3 & 4 are different layers of rocks. Note the difference in level of the same layers on either side.

The plateau has a mountain rim surrounded by a narrow coastal plain. The mountain rim rises from the coast to the interior in terraces which are well marked on

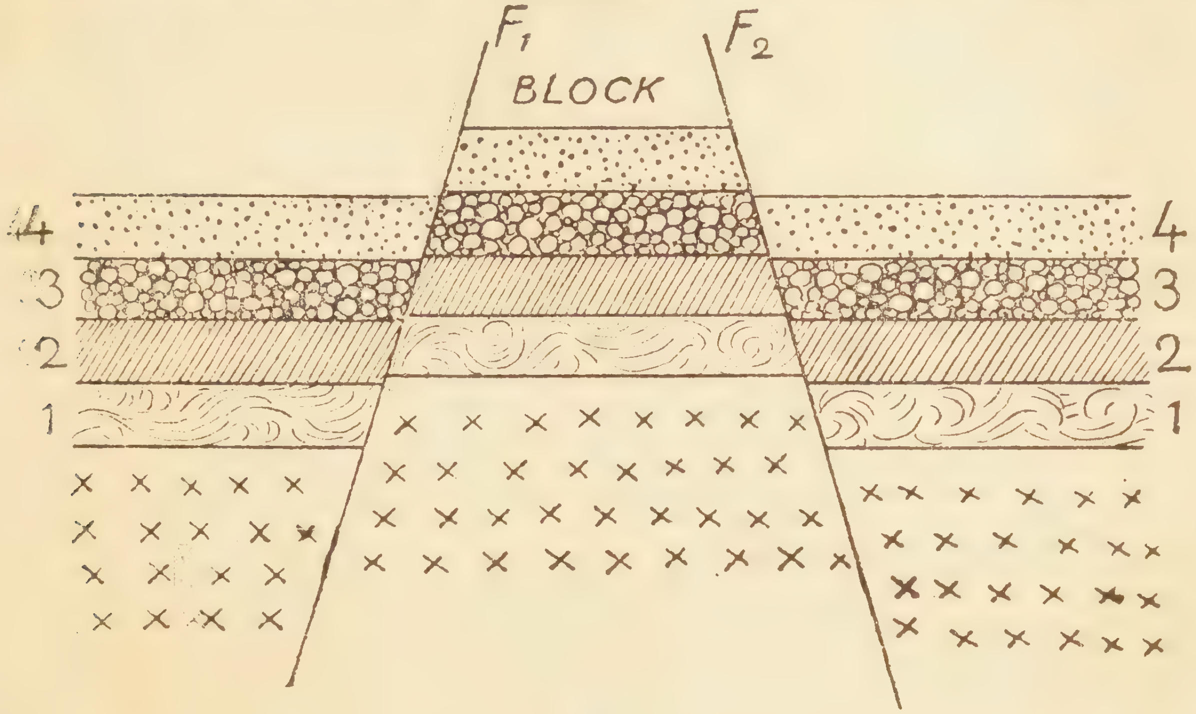


FIG. 4. Block-formation
F 1 & F 2—Fault lines

[Parts of land which have been left standing while the land surrounding them has been lowered, are called 'blocks'.]

the east and south. The terraces of the south are known as the "*Karroos*" (Fig. 5)

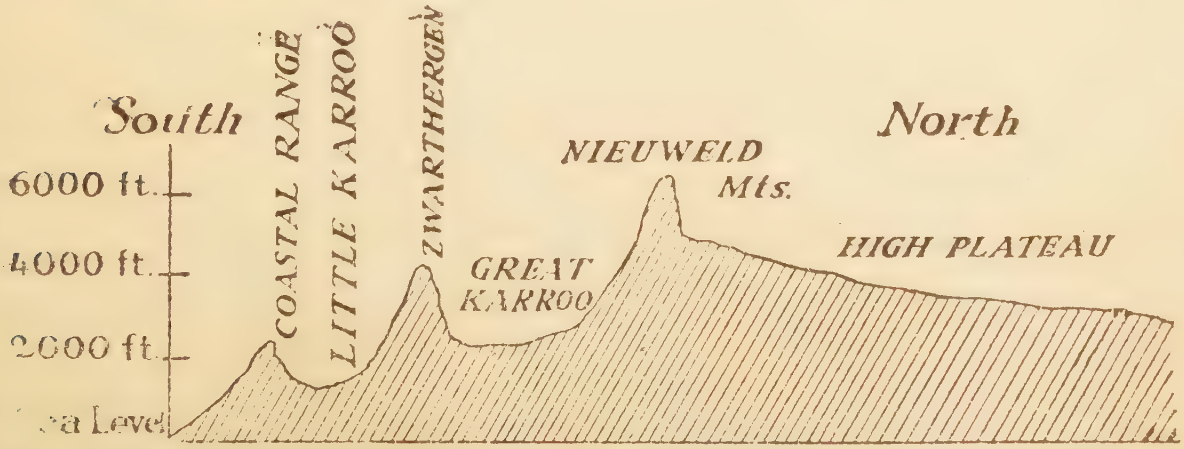


FIG. 5. Diagrammatic section of the southern end of the African Plateau showing terrace formation.

But the African plateau is not of uniform elevation. It is much higher in the south and east than in the north.

The higher plateau in the south reaches a maximum height of 3000 to 4000 ft. in a broad belt stretching north-east to south-west from Abyssinia to the south-west coast. But the northern lower plateau has an average elevation of not more than 2000 ft.

From the higher plateau of the south and east three arms are sent into the lower plateau of the north (Fig. 2). The first of these extends through Abyssinia and along the shores of the Red Sea into Egypt. The second stretches north-west across the low plateau as the *Tibesti* mountains (8860 ft.). It forms a divide between the Congo and Lake Chad basins on the one side, and the Nile basin on the other. The third stretches from Angola northwards to the *Cameroons* and thence bends westward parallel to the Gulf of Guinea ending in the *Futa Jallon Highlands.* This plateau arm is broken by the Niger and its tributary, the Benue. *Mt. Cameroon* is an extinct volcano having an elevation of 13,370 ft.

The southern table-land reaches its highest elevation on its southern and south-eastern margins. The *Drakensbery* in the south-east has peaks which are over 11,000 ft. In the Cape province, as we have already stated, the land rises from the narrow coastal plain in terraces called *Karroos* (Fig. 5) separated by narrow ridges. The lower terrace is called the *Little Karroo* and the higher terrace, the *Great Karroo.* Beyond this lies the *Nieuveld* Range which forms the edge of the *High Veld Plateau* of South Africa.

Rift Valleys : One peculiar feature in the structure of Africa is the *Great Rift Valley* (Fig. 6). A rift valley is formed by the sinking of the land between two parallel faults in the layers of rocks of the earth's crust (Fig. 7). Spencer Gulf and Lake Torrens in Australia are formed in

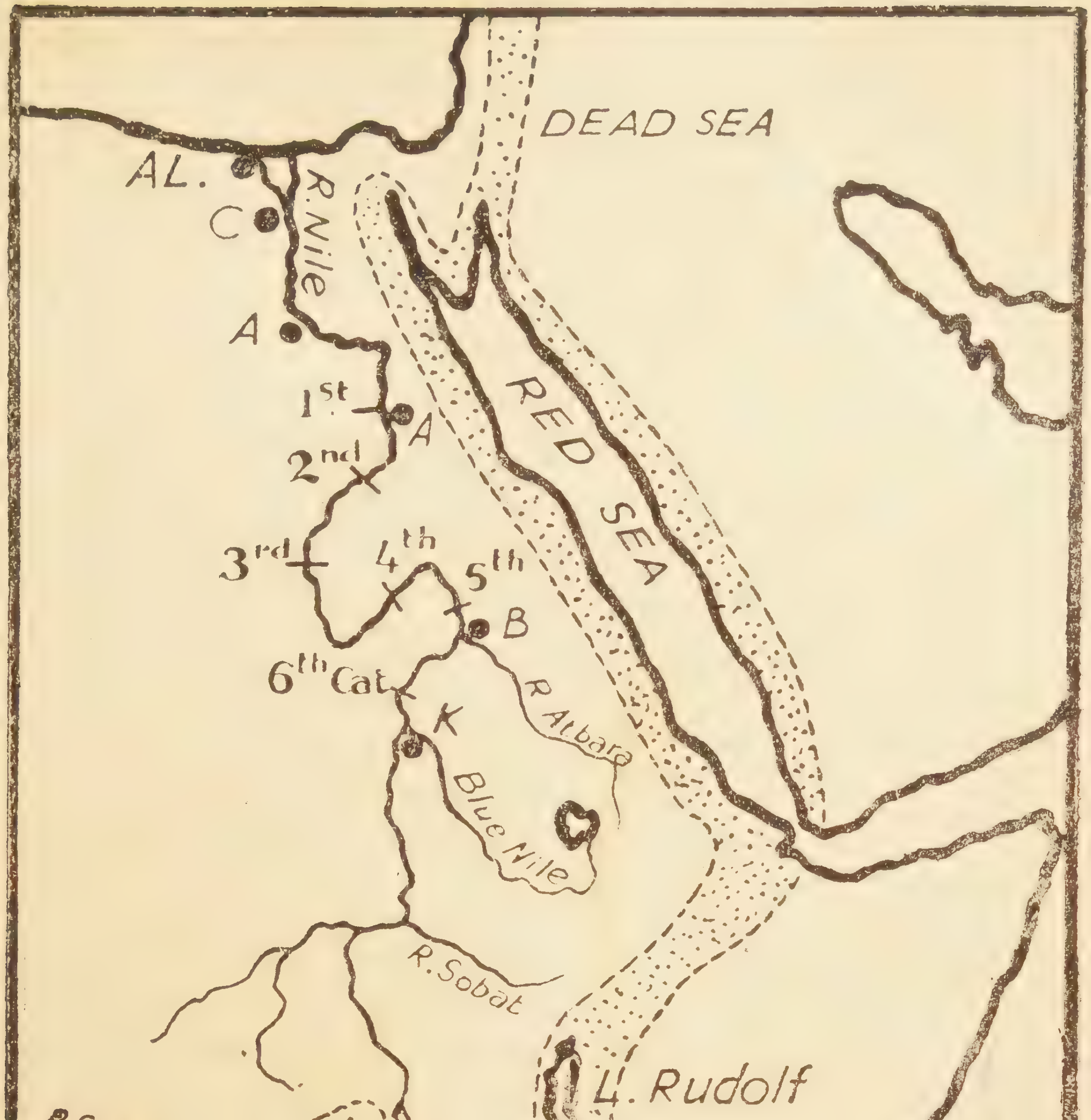


FIG. 6. The NILE and the Lakes of the RIFT VALLEY.

such a rift valley. The Great Rift Valley extends from the Dead Sea in Palestine to the southern end of *Lake Nyasa* in Africa with a branch running northward west of *Lake Victoria.* The eastern rift valley contains the *Red Sea* and *Lakes Redolf* and *Nyasa*, and the western rift contains *Lakes Tanganyika, Edward* and *Albert.* In the plateau between the two rift valleys is a huge depression which contains *Lake Victoria*, the second largest fresh water lake in the world. Which of these lakes are connected with rivers and which are not? What can you infer as regards the nature of the water of the lakes?

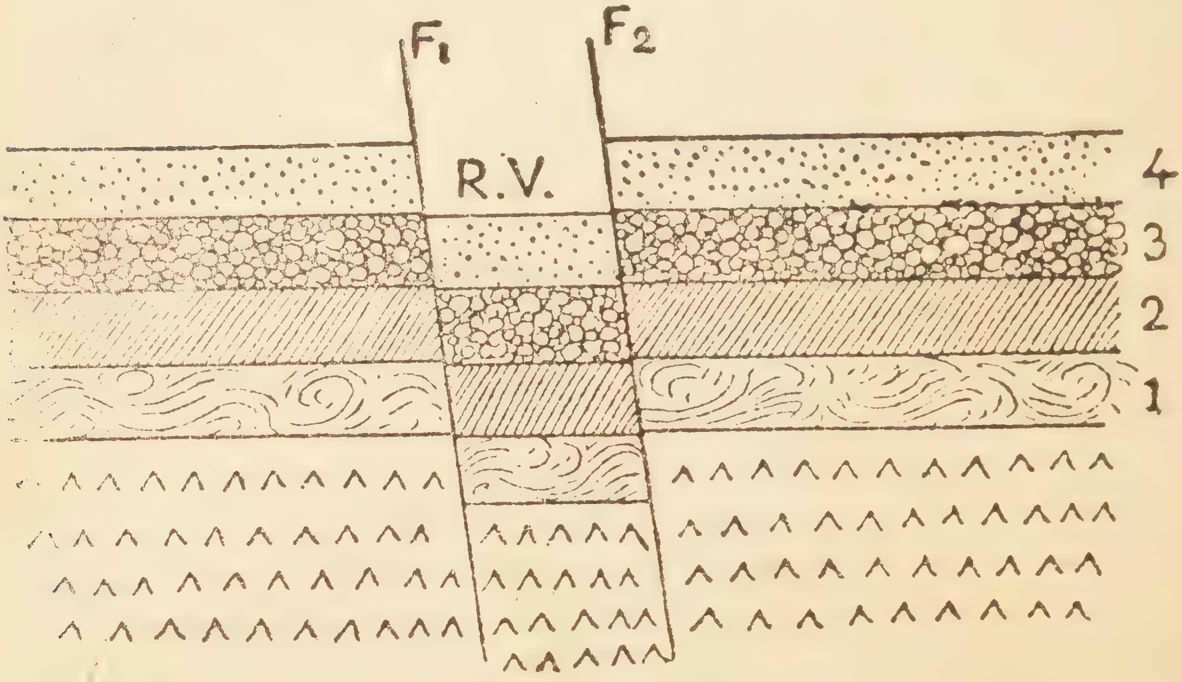


FIG. 7. Diagram showing the formation of a Rift Valley.
1, 2, 3 & 4—Different layers. F 1, F 2—Faults. R. V.—Rift Valley.

Extinct Volcanoes : Associated with the formation of these rifts there was great volcanic activity. The *Abyssinian Highlands* form a plateau built mainly of volcanic rocks. Some of them reach a height of over 15,000 ft. It is this volcanic soil that is supplied to Egypt by the Blue Nile which rises in *Lake Tsana* which occupies the crater of an extinct volcano. On the eastern edge of the eastern rift are the extinct volcanic peaks of *Kenya* (17,200 ft.), and *Kilimanjaro* (19,710 ft.) On the margin of the western rift between Lakes Albert and Edward lies the *Ruwenzori*, (Mountain of the Moon, 16,815 ft.).

The Atlas Mountains: The *Atlas* mountains in the north-west corner of Africa are the only true mountain system formed by the folding of the earth's crust. (Fig. 8).

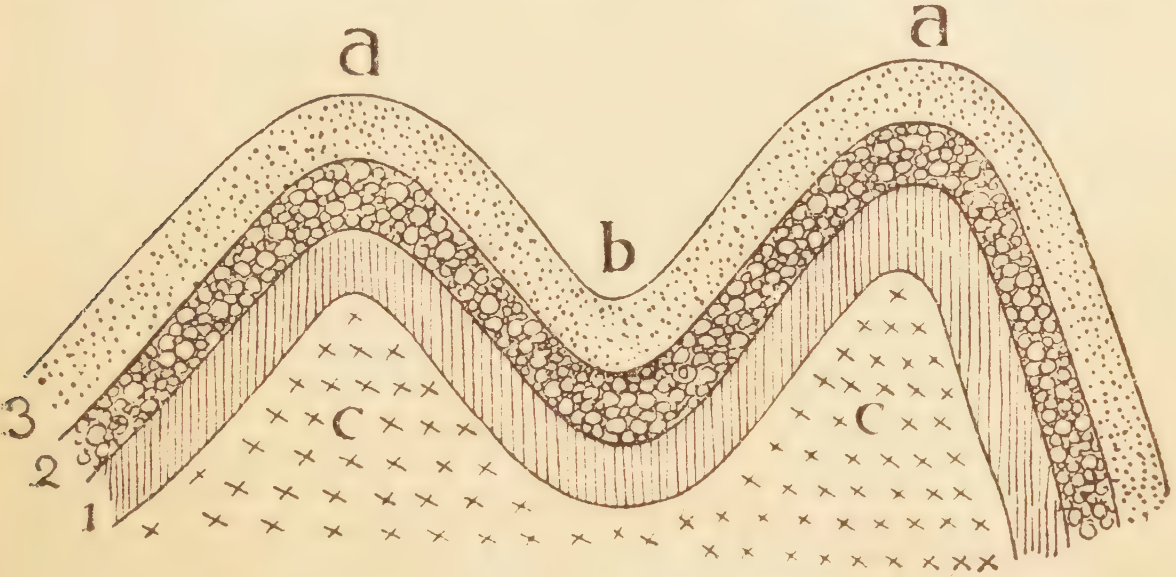


FIG. 8 A Fold.

1, 2, 3—different layers. (a) Up-fold or Mountain.
(b) Down-fold or Valley. (c) Old crystalline rocks.

[When the top layers 1, 2 & 3 are worn away in course of time, 'C' forms the mountain ridge.]

These mountains consist of parallel ridges which were once connected with the Seirra Nevada of Spain through Gibraltar and with the Apennines of Italy through Sicily (Fig. 1). The highest portion of the Atlas mountains is in Morocco where they are known as the *Great Atlas*, the highest peak being 14,760 ft. Further east there are two main ranges which enclose a plateau. The southern range is the *Sahara Atlas*, and the northern range the *Tell Atlas*.

The enclosed upland is called the *Plateau of the Shotts* or *Salt Lakes*. The fertile lowland region near the sea and the fertile valleys behind form the *Tell Region.*

Obstacles to Early Exploration: Although northern Africa was known to be the seat of the earliest civilisation, the interior of the continent was unknown to to Europeans until the latter part of the last century. Because the absence of long arms of the sea penetrating far inland and the falls and rapids of the rivers at the edge of the plateaus made access to the interior of the continent very difficult. The great Sahara cut off travel by land. The trade winds that helped sailing vessels of Europe in their southward journey to Africa, hindered their return journey northward. The coasts of the central parts of Africa are swampy and malarial; in other parts the shores are so barren that people landing on them can find neither food nor water. All these were obstacles to the early explorers. Therefore, Africa was long known as the "*Dark Continent,*" because so little was known of its interior.

EXERCISES

(1) At what points does Africa nearly join Eurasia?
(2) Africa is three times the size of Europe; but it has a shorter coast-line. Why?
(3) Explain the terms "faulting," "rifting" and "folding."
(4) How does Madagascar differ in origin from the Atlantic islands?
(5) Give an account of the Atlas mountains.
(6) How does the build of Africa cause waterfalls in its rivers?
(7) What causes helped to make Africa a 'Dark Continent'?

CHAPTER II

RIVERS AND LAKES

Peculiarities of African Rivers: African rivers have certain peculiarities which are due to the build of the continent :—

(1) There is no well-marked axis of water-parting and so *the rivers flow in all directions.*

(2) They have *no definite mountain and plain stages* as the rivers of other continents have.

(3) The plateau is broken up into 'blocks' and so the rivers have to creep round the edges of these blocks. Hence they have *semi-circular or S-shaped bends, e.g.*, the Niger, the Nile and the Zambesi.

(4) The plateau slopes alternately east and west, and so rivers also *flow alternately east and west e.g.*, the Congo flows west and the Zambesi east ; the Limpopo flows east and the Orange west.

(5) The slopes of the blocks meet in the interior ; hence *many streams meet together*, as in the case of the Congo Basin.

(6) All rivers have to cut through the rim of the plateau before descending to the coastal plain ; hence they are *obstructed by rapids and falls* and, therefore, not fit for continuous navigation. But these falls may prove to be sources of hydro-electric power in the future.

(7) The river basins are separated from each other by low divides. Therefore they are *close to each other*; *e.g.*, the basins of the Nile, the Congo, and Lake Chad.

Africia is drained by four large rivers—*the Nile* flowing into the Mediterranean Sea, *the Congo* and the *Niger* into the Atlantic Ocean, and *the Zambesi* into the Indian Ocean. *The Senegal, the Gambia, the Orange* and *the Limpopo* are of secondary importance.

The Nile (about 4000 miles long) (Fig. 6) rises in *Lake Victoria* in the plateau of Equatorial Africa which receives a good rainfall all the year round. Therefore the Nile is a constant stream. After leaving the plateau by rapids the main stream enters *Lake Albert* which receives the outflow of *Lake Albert Edward.* Leaving Lake Albert, *the White Nile,* as the river is now called, enters Egyptian Sudan, where the country is so flat that the river flows slowly. Hence floating masses of vegetation called *sudd* collect, blocking the navigation of the river and causing floods. Hence large areas are covered with marsh. The *Bahr-el-Ghazal,* the only left bank tributary of the Nile, joins it in this region. The middle Nile receives three tributaries—*the Atbara, the Blue Nile* and *the Sobat.* All these rise in the Abyssinian plateau which gets its rain in summer. The Blue Nile joins the main river at *Khartoum* and the Atbara at *Berber.* These streams are dry in winter, but after the summer rains, they become roaring torrents carrying large quantities of water and much volcanic sediment to the main river. The resulting floods are very important to Egypt.

North of *Berber,* the river passes through a narrow valley cut in the desert plateau for about 1800 miles where it receives no tributaries. (*cf.* the Indus). In this course it loses much of its water by evaporation, absorption by the hot soil, and irrigation. Between *Khartoum* and *Berber,* the river passes through its sixth cataract and north of *Berber*, there are five other cataracts. So the Nile is navigable only *below Assuan* where there is a huge dam built across it, and *above Khartoum.*

At *Cairo* the delta of the Nile begins. The soil of the delta is very rich, but it has to be irrigated unlike the delta of the Ganges. By far the most important part of the Nile valley lies in Egypt. The valley and delta of the river which form the real Egypt, have been built of the rich alluvium which the flood waters have brought from the Abyssinian plateau. Hence Egypt is called "the gift of the Nile."

The Nile forms the link between the Mediterranean Sea and Equatorial Africa.

The Congo (3000 miles): This rises not far from *Lake Nyasa* with the name of the *Luapula*, which after passing through *Lakes Bangweolo,* and *Mweru*, is joined by a navigable tributary from the south, *the Lualaba.* A little further north, it is joined by the *Lukuga*, an outlet to *Lake Tanganyika.* Below this the river is nearly a mile broad and is navigable up to the equator where it is impeded by the *Stanley Falls.* Here the river turns westward, and further on south-westward until it expands into *Stanley Pool* (25 miles by 15 miles). In this part of its course, the river receives many tributaries and forms a magnificent waterway for about 1000 miles. After passing Stanley Pool, the river descends the plateau edge by a series of falls known as the *Livingstone Falls.* The river has a broad estuary which is navigable for ocean-going vessels up to *Matadi.* As it flows through a region of very heavy rainfall and receives plenty of tributaries on both sides, the Congo brings down a greater volume of water than any other African river.

The Niger (2200 miles) rises in the Futa Jallon Highlands and flows into the Gulf of Guinea after a circuitous course. It first flows inland to the desert margin at *Timbuktu*, and then turning south-east it cuts through the edge of the plateau by a series of falls rapids. It has a rapidly growing delta. It is navigable for steamers as far as *Rabba* below which it receives the *Benue* from the left. This stream forms a navigable waterway for hundreds of miles.

The Senegal and the Gambia: These rise in the same highlands as the Niger, but flow westwards into the Atlantic. They are navigable from the sea for some distance inland.

The Orange: This is another river flowing into the Atlantic Ocean and is of little use for navigation, for it has rapids at various places and is obstructed by a bar at the mouth. Further it has only a small volume of water. Its chief tributary is *the Vaal.*

The Zambesi (2000 miles): This river is the chief eastward-flowing river. Like other rivers of Africa, it is obstructed by rapids and falls which cause breaks in the navigation of the river. *The Victoria Falls*, the grandest in the world, are about 400 ft. high. Below the falls the river passes through a narrow [illegible] gorge 45 miles long and 15 yards wide. It is again obstructed by a fall in its lower course where it turns south-east. The delta of the river has 'eight mouths' of which only two are navigable for steamers of shallow draught. *The Shire*, a tributary of the Zambesi, forms the outlet of *Lake Nyasa* and this is also obstructed by rapids. Like the other South African rivers the Zambesi is seasonal in its volume.

The Limpopo ('Crocodile River' 1000 miles) also flows east into the Indian ocean. It is too rapid for navigation in wet seasons and too shallow at other times.

Areas of Inland Drainage: In the Sahara, the rainfall is very scanty, so there are few rivers. If at all any river is formed, it cannot have sufficient volume to reach the sea. It should either empty itself into any depression in the interior or dry up after a certain distance. Some of the streams flow into *Lake Chad*, a shallow sheet of water that varies in size with the season. The chief river flowing into the lake is *the Shari.*

Another area of inland drainage is in the Kalahari Desert. Here the rivers flow into the shallow *Lake Nagami* which, when overfull, finds an outlet by a branch leading to *the Makari-kari salt pans.* *Lake Rudolf* of the Rift Valley and the Shotts of the Atlas plateau are other areas of inland drainage.

EXERCISES

(1) Mention the characteristic features of the African rivers. How far are they due to the structure of the continent?
(2) In what respects does the Nile resemble the Indus?
(3) Compare and contrast (*a*) the Nile and the Congo; (*b*) the Nile and the Niger; and (*c*) the Niger and the Congo.
(4) Explain: "Egypt is the gift of the Nile."
(5) Which African lakes are basins of Indian drainage?
(6) Identify the following:
  (*a*) "This lake is larger than Ceylon."
  (*b*) "It forms a natural highway into the heart of the continent."
  (*c*) "These are the four 'great arteries' of Africa."
  (*d*) "This lake varies in size with the season."

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CHAPTER III

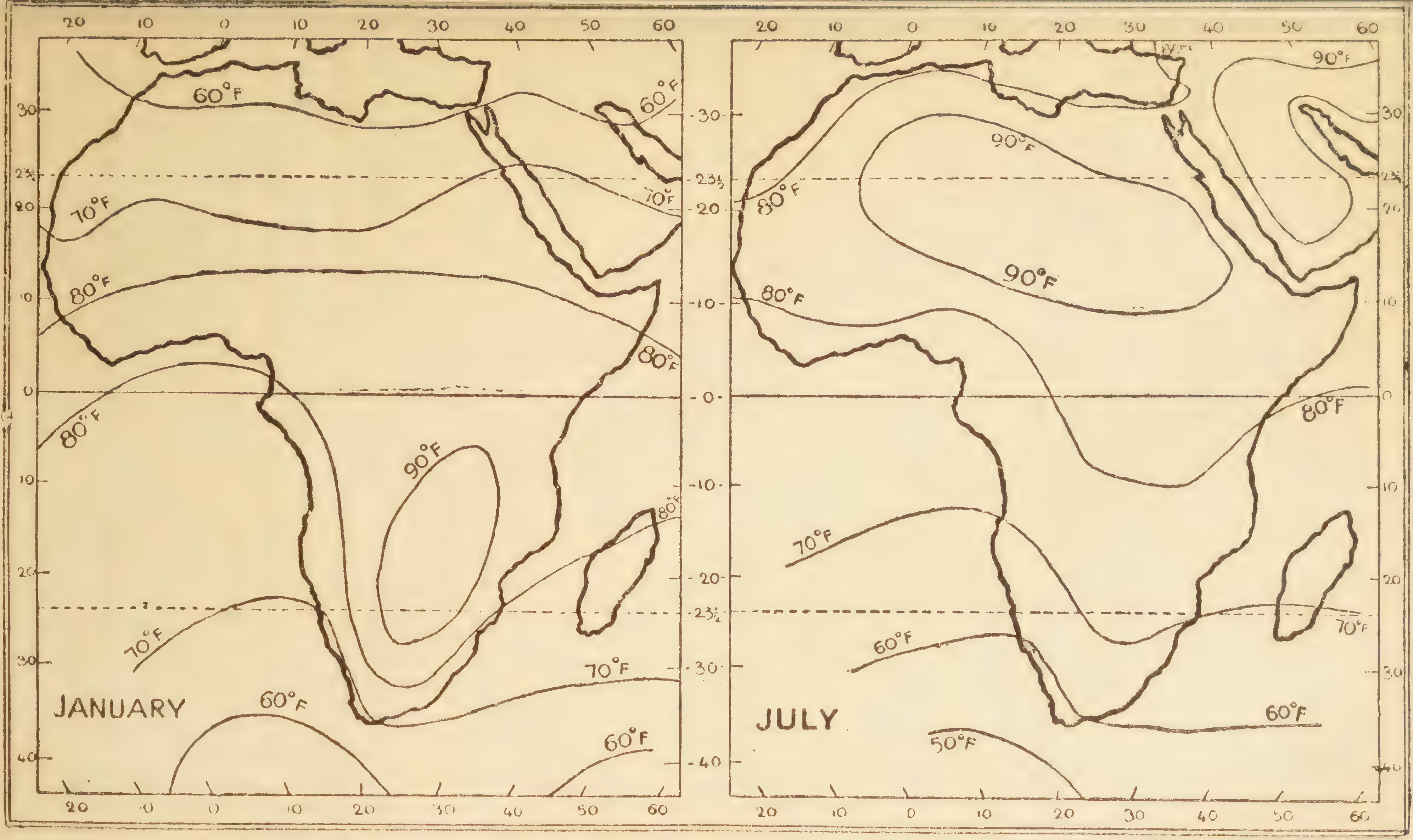
CLIMATE

TEMPERATURE

As a large portion of the continent lies within the Torrid Zone, the temperature of Africa is uniformly high except in the extreme north and south. Again, as the continent is a compact land mass, the temperature of very large areas is not moderated by any sea influence. But in the east and south the temperature is reduced by altitude; hence the tablelands of the south and the east become suitable for white settlement. But the most important of the climatic factors in Africa is its position on both sides of the equator. When it is the *summer half* of the year north of the equator, it is the *winter half* south of it, and *vice versa.*

Study the temperature maps of January and July (Fig. 9). The isotherms here show sea-level temperatures. January is typical of northern winter and southern summer, and July is typical of northern snmmer and southern winter. We cannot talk of the summer and winter of the whole of Africa as we can in the case of India or Australia. Why?

In July, when the sun is overhead north of the equator, the region having a temperature over 90° F. lies over the Sahara; but south of the equator the temperature gets less and less, until it is less than 60°F. In the south-west corner July is a summer month in N. Africa as in India, but it is a winter month in South Africa as in Australia.



January Isotherms

July Isotherms

FIG. 9. TEMPERATURE

In January, when the sun is overhead south of the equator, the area of greatest heat (over 90°F.) lies over the southern plateau ; but north of the equator the temperature decreases to less than 60°F. along the north coast. January is a summer month in South Africa as in Australia ; but it is a winter month in North Africa as in India. This clearly shows the seasonal swing of temperature north and south of the equator which is due to the apparent migration of the sun north and south.

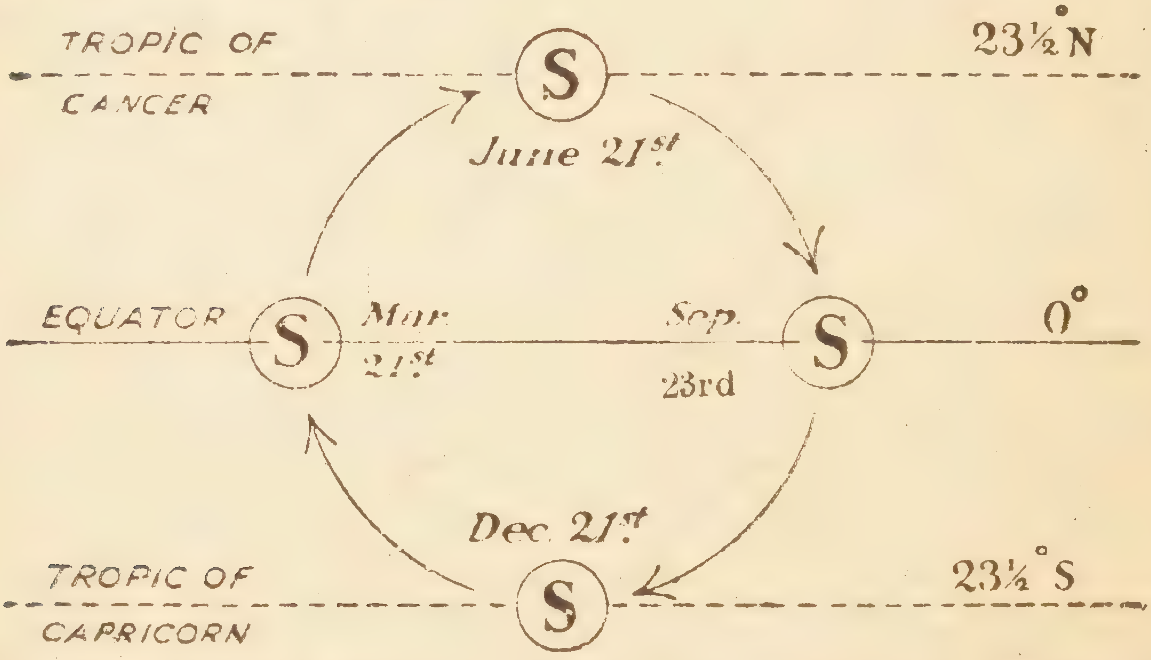


FIG. 10. Diagram showing the apparent movement of the sun within the Tropics.

Notice the northward bend of the isotherms along the west coast, especially that of the 80° F. January isotherm. Inside the continent it dips suddenly southward from the equator up to 30° S. Latitude. What does that show ? The west coast has a lower temperature than the east. This is due to the ocean currents. The cold *Benguela Current* lowers the temperature of the west-coast, while *the Mozambique or Agulhas Current* warms up the east coast south of 15° south latitude.

From a study of the temperature maps we can gather the following points:—

(1) The mean annual temperature of Africa is more than 70° F.; *i.e.*, the continent is hot.

(2) In the equatorial belt there is little difference between the warmest and the coolest month.

(3) The regions of great seasonal range of temperature lie near the tropics.

(4) The region of greatest heat is much larger in the north than in the south. Why?

(5) Even in the *winter* months the extreme north and south are only warm temperate.

WINDS AND RAINFALL

You know that the rainfall of a country largely depends on the way the winds blow. You know also that there are four wind belts in the world:—*the S. W. Antitrades, the N. E. Trades, the S. E. Trades, and the N. W. Antitrades.* Which of these four winds prevail in Australia? To what coasts of Australia do they respectively give rain?

Now let us consider what the effect of these winds will be on the *west side* of continents like Africa. From figure 3 in Part I (Australia) you can see, that all these four winds blow in Africa. The westerlies blow from the sea to the land and so bring rain, while the easterlies blow from the land to the sea and so give little rain to the west coast. But if the easterlies come from the sea they give rain to the east coast.

Between the two trade-wind belts there is a low pressure belt of calms (Fig. 3. Part I). Why? Study Fig. 11; the two trade winds meet and push the heated air upwards, and hence there is always an ascending movement of air.

Therefore the pressure of air is low. Again, here winds blow neither to the north nor to the south, and so it is a

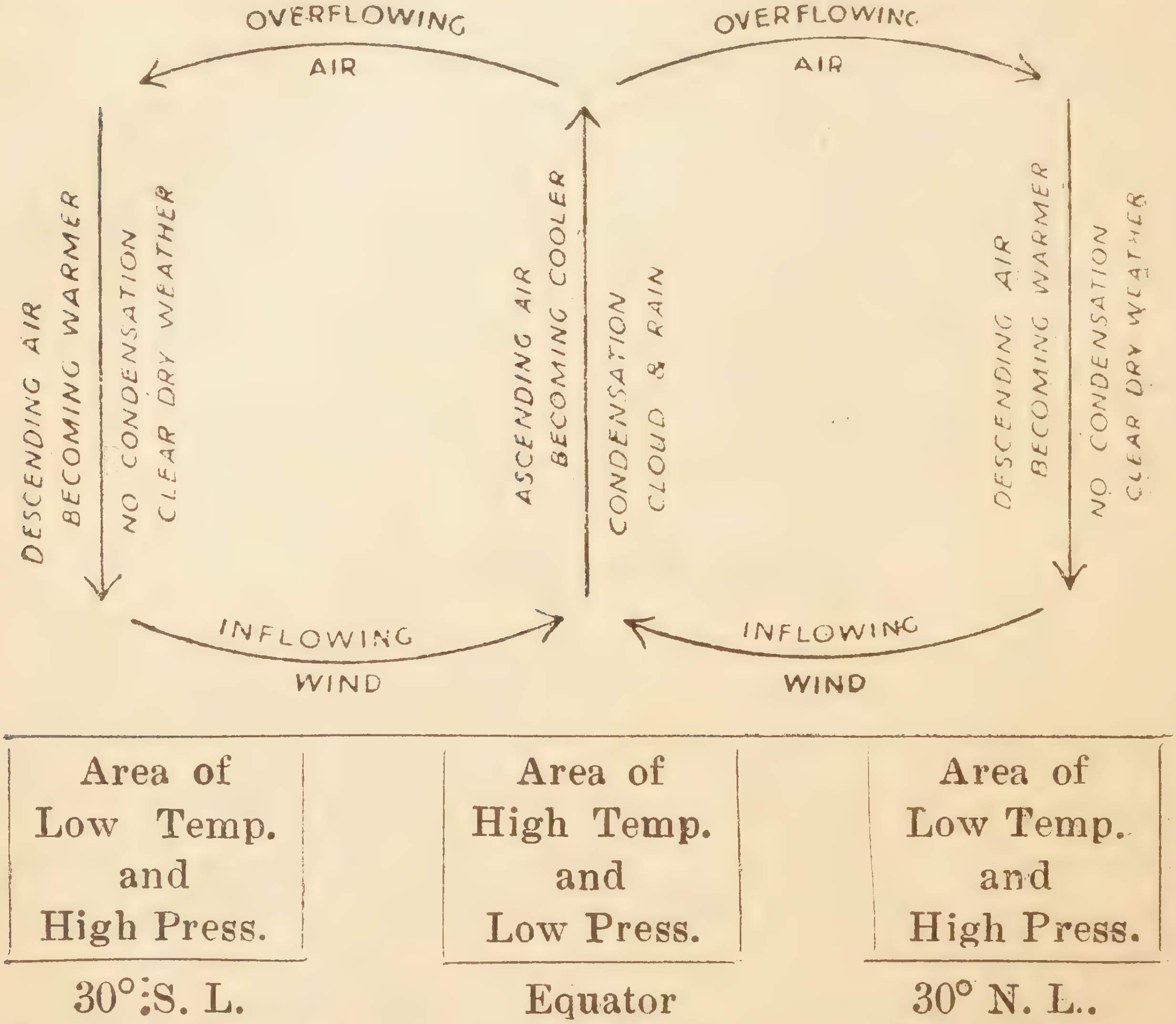

OVERFLOWING AIR
OVERFLOWING AIR
DESCENDING AIR BECOMING WARMER
NO CONDENSATION CLEAR DRY WEATHER
ASCENDING AIR BECOMING COOLER
CONDENSATION CLOUD & RAIN
DESCENDING AIR BECOMING WARMER
NO CONDENSATION CLEAR DRY WEATHER
INFLOWING WIND
INFLOWING WIND
Area of Low Temp. and High Press.
Area of High Temp. and Low Press.
Area of Low Temp. and High Press.
30° S. L.
Equator
30° N. L.

FIG. 11. Diagram showing high and low pressure belts of calms.

belt of calms known as the *Doldrums*. There is also a belt of heavy rainfall. This rainfall is due not to any winds that blow here, but to the ascending movement of air ; for, as the air rises it expands and is cooled, and the moisture it contains is turned into rain.

Between the trades and the antitrades there are high pressure belts (Fig. 3 Part I). Here some of the upper air descends and so the pressure of air is high. Over these belts also there are calms, called '*the Horse Latitude.*' These belts are regions of little rainfall ; for, as the air descends it is compressed and warmed, and the moisture it contains is therefore not turned into rain. The weather here is clear. It is said that the curious name 'Horse Latitudes' is due to the fact that "sailing ships laden with horses and bound for America or the west Indies were often obliged, when becalmed in this belt, to save their supply of water by throwing the horses overboard."

Compare the two seasonal rainfall maps (Figs. 12 & 13). Fig. 12 shows northern summer conditions—May to

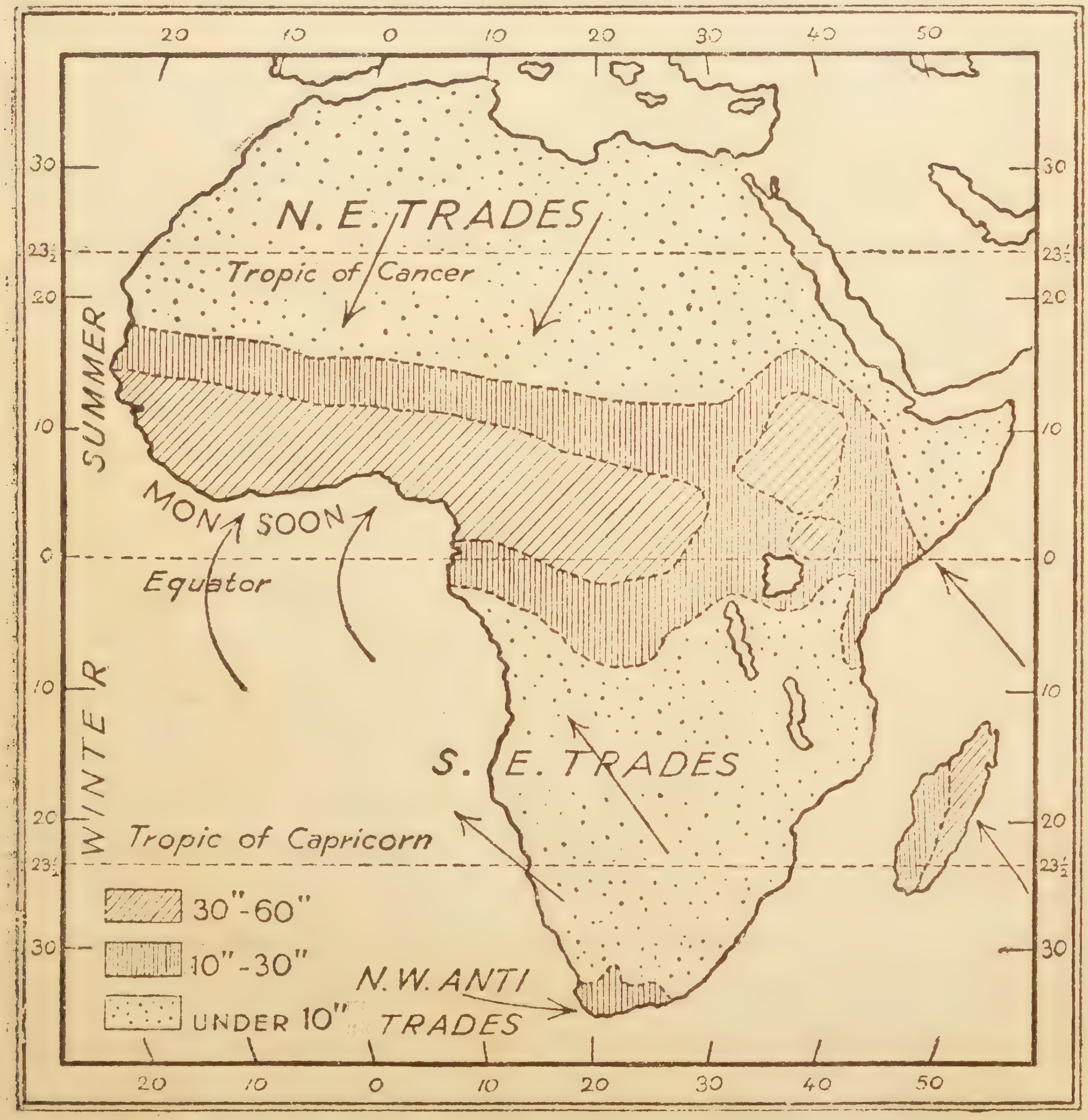


FIG. 12. Rainfall and Winds: May to October (Northern Summer),

October. Fig. 13 shows northern winter conditions—November to April. In the northern summer map the belt of heavy rainfall lies north of the equator and rain extends inland as far as 15° N. L.; while in the northern winter or southern summer map the belt of heavy rain lies to the south of the equator. You can easily see that this swing of

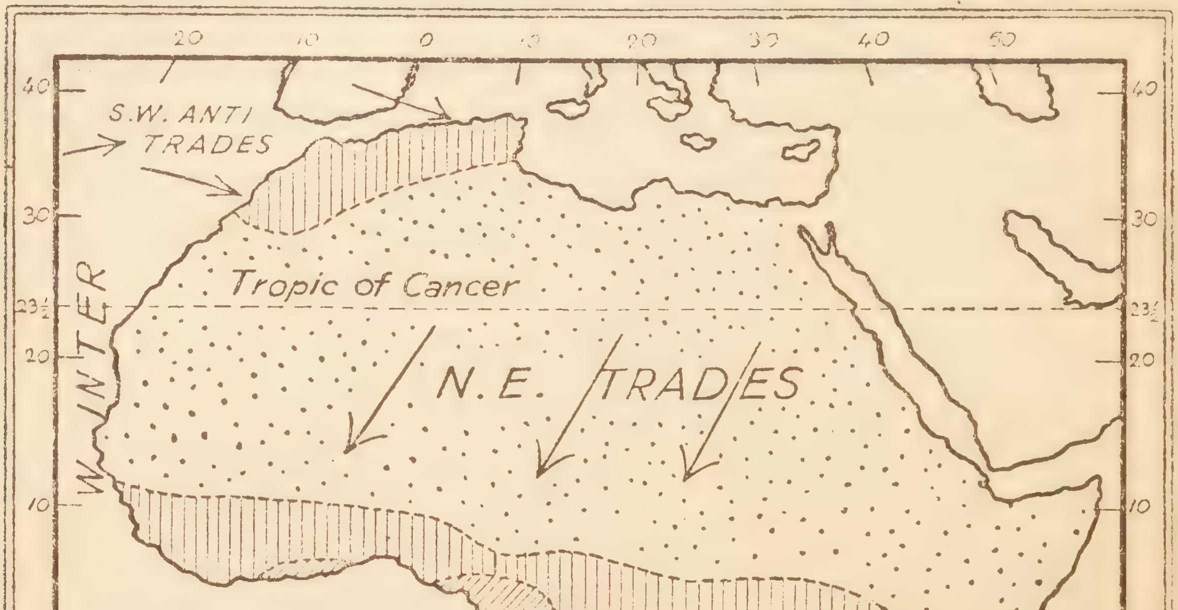


FIG. 13. Rainfall and winds: November to April (Northern Winter)

the belt of low pressure and high temperature which in its turn is the result of the sun's annual migration between the tropics. This is what we mean by saying that *the rain follows the sun.*

In the northern summer (Fig. 12) the sun's rays are vertical over the Tropic of Cancer and the consequent great heat of the Sahara region produces a low pressure area there. So the S. E. trades of the Atlantic ocean are drawn across the equator and blow as the south-west monsoon, giving heavy rainfall to the Guinea Coasts and Western Sudan. (Compare the south-west monsoon of India). The south-east trades of the Indian Ocean are drawn across the equator and give heavy rain to the Abyssinian Highlands causing the floods of the Nile. The whole of North Africa is dry, for the north-east trade winds which blow here are dry land winds.

In South Africa there is a centre of high pressure as the temperature there is low; hence the trade winds are not drawn in and so they do not give any rain. Therefore Africa, south of the equator, has its dry season now. As the wind belts shift northwards a small area around Cape Town in the south-west corner comes under the influence of the N. W. Antitrades (or Brave West Winds) and gets *winter* rains. This is the "Mediterranean" region of South Africa corresponding to the south-west corner of Western Australia.

In the northern winter (Fig. 13) the sun shines vertically south of the equator and the centre of low pressure lies there. The south-east trades from the Indian Ocean are drawn in and give heavy rainfall to Africa south of the equator. The rainfall is heaviest on the east coast and gets less towards the west, so that there is a dry area along the west coast. Near the equator the rainfall is due to the ascending movement of air.

As the wind belts shift southwards with the southward movement of the sun, the north-west corner of Africa known as the atlas region comes under the influence of the S. W. antitrades and gets its *winter* rains. This is the "mediterranean" region proper. The whole of North Africa excluding the Atlas region lies within the Trade Wind belt and is therefore dry.

Madagascar lying in the track of the S. E. trade winds receives good rainfall throughout the year except on the west coast, which lies in the *rain shadow.*

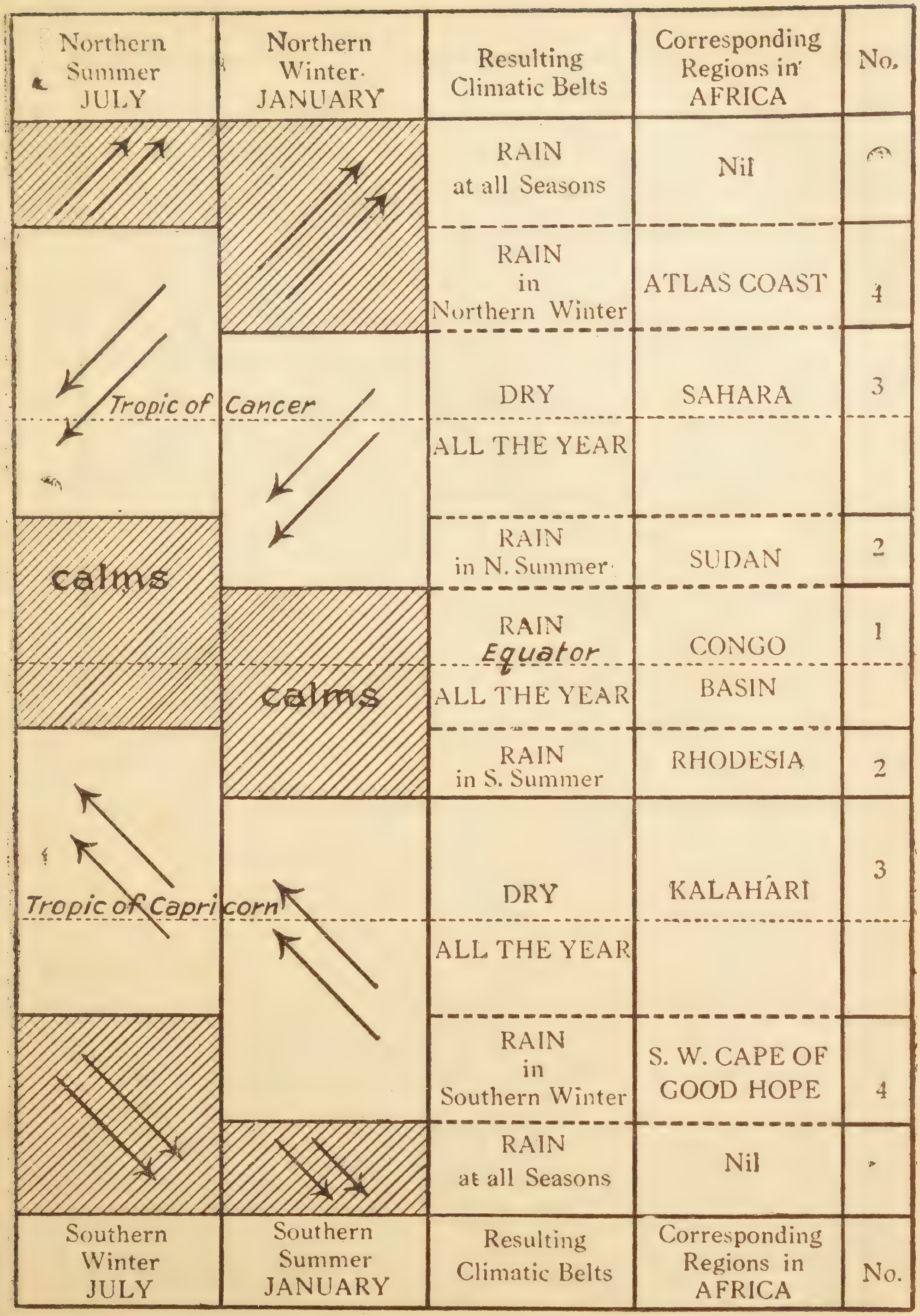
The ' Horn of Africa ' (Somaliland) is dry, because in summer the south-west monsoon blows parallel to its coast and in winter the north-east trades blow from the Arabian plateau.

DUPLICATION OF CLIMATIC BELTS

The diagram facing this page clearly illustrates the swinging of the wind and rainfall belts and the resulting climatic belts especially along the west side of continents. Column (A) shows northern summer conditions, (B) northern winter conditions, (C) the resulting climatic belts, and (D) the corresponding regions in Africa.

(1) The Congo Basin and Guinea Coast are regions of *constant rainfall*; (2) Sudan and Rhodesia (the Zambesi basin) are regions of *summer rain* ; (3) the Sahara and Kalahari deserts are regions of *little rain* ; and (4) the Atlas coast (Mediterranean) and the south-west corner of the Cape of Good Hope are regions of *winter rainfall.* Note the duplication of climatic belts north and south of the equator. Which of these belts are to be found in Australia ?

Study carefully the mean annual rainfall map of Africa (Fig. 14). Note that the two deserts lie about the tropics and that the Kalahari does not extend right across



Resulting Climatic Belts	Corresponding Regions in AFRICA	No.
RAIN at all Seasons	Nil	[illegible]
RAIN in Northern Winter	ATLAS COAST	4
DRY ALL THE YEAR	SAHARA	3
RAIN in N. Summer	SUDAN	2
RAIN ALL THE YEAR	CONGO BASIN	1
RAIN in S. Summer	RHODESIA	2
DRY ALL THE YEAR	KALAHARI	3
RAIN in Southern Winter	S. W. CAPE OF GOOD HOPE	4
RAIN at all Seasons	Nil	
Resulting Climatic Belts	Corresponding Regions in AFRICA	No.

▨ Belts of calms and westerlies—Wet Belts.

▭ Trade-wind or dry Belts.

Diagram showing migration of wind and rain belts and the consequent distribution of wet and dry belts on the western margin of continents.

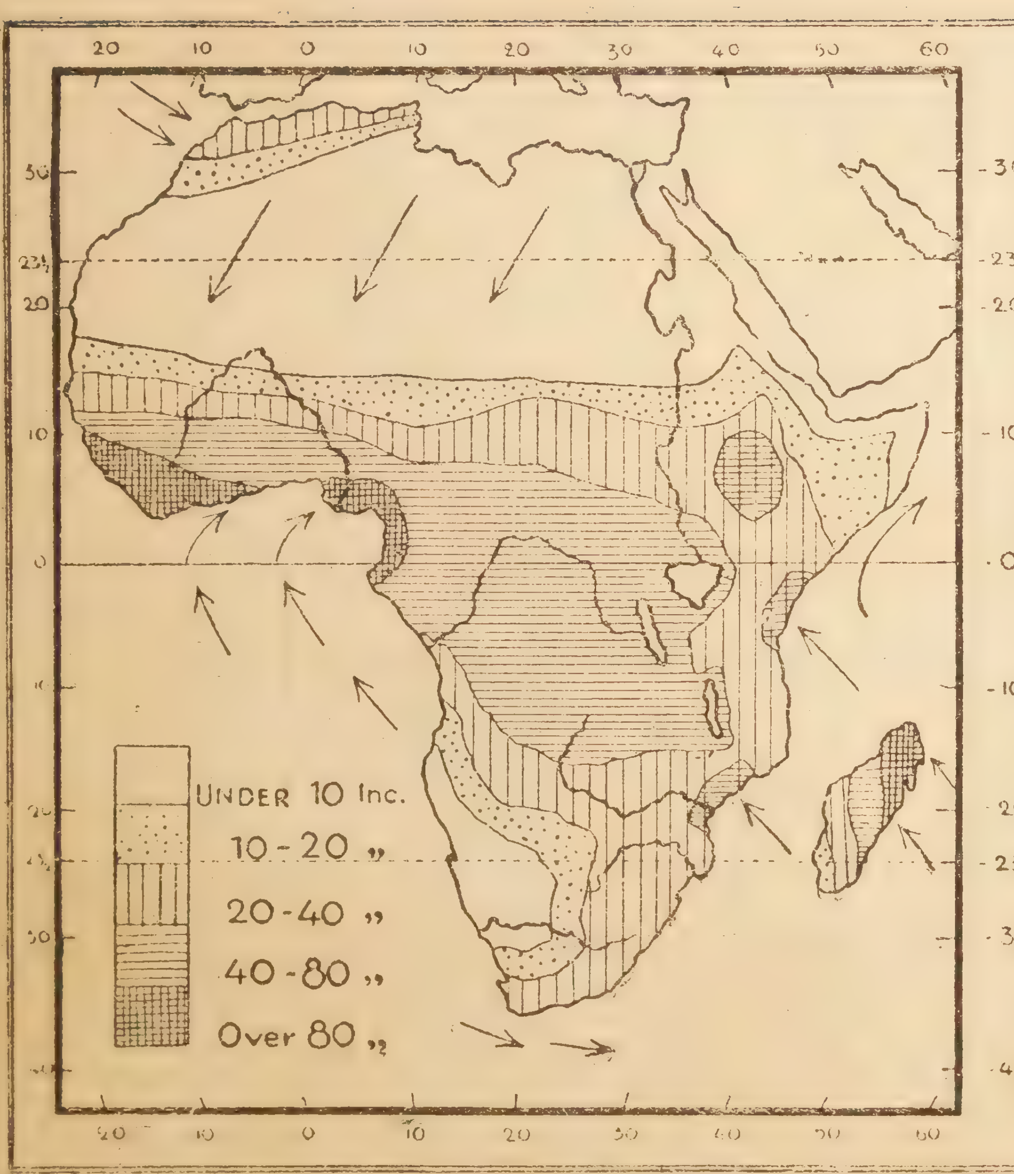


FIG. 14. Mean Annual Rainfall.

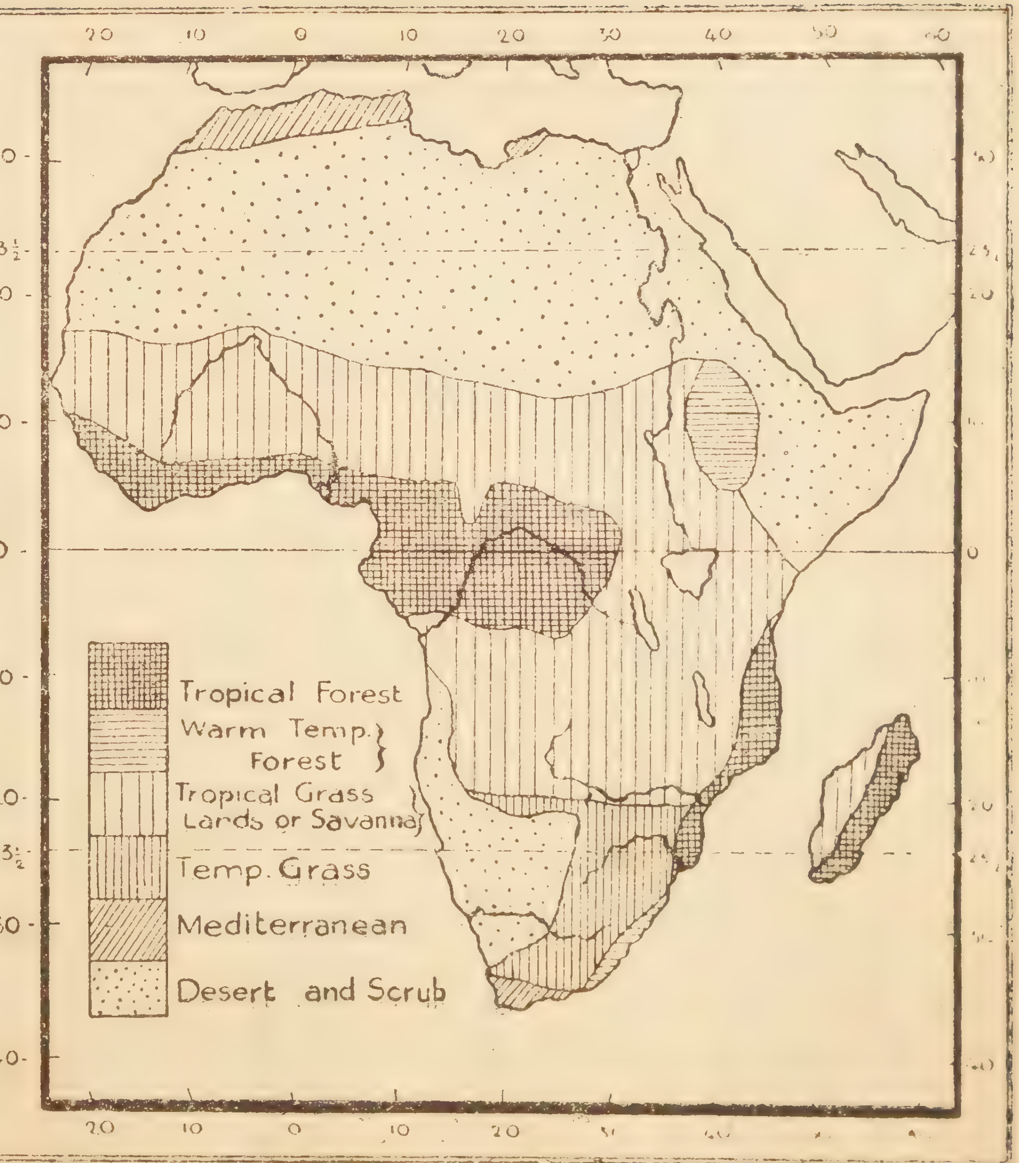


FIG. 15. Natural Vegetation.

the continent as the Sahara does. This is because the north-east trades are entirely land winds, while the south-east trades bring moisture from the Indian Ocean. We thus notice four climatic belts on the west side of the continent.

Besides these, there are three other climatic regions on the eastern side of the continent.

CLIMATIC BELTS

(1) **The Equatorial or 'Constant Rain' Belt:** This is always hot and wet, and lies along the equator especially in the Basin of the Congo and along the coast of the Gulf of Guinea. The Congo basin has *a double rainfall maximum*; one when the sun passes north and another when it returns south. But in the Guinea Coast the rainfall is greatest during the season of the south-west winds, *i.e.*, May to October. But in the Congo Basin it is evenly distributed throughout the year. Compare *Free Town* (Guinea Coast) and *New Antwerp*, 2° N.L. (Congo Basin).

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Free Town	0·6	0·5	1·1	5·4	14·8	21·3	36·8	39·6	32·5	15·2	5·3	1·3	174·4
New Antwerp	4·1	3·5	4·1	5·6	6·2	6·1	6·3	6·3	6·3	6·6	2·6	9·3	70·0

The range of temperature in this area between the warmest and coolest months is not more than 4° F.

(2) **The Tropical or 'Summer Rain' Belt:** This, with rain only in the summer half of the year, lies north and south of the equatorial belt. This includes the Sudan in the north and Angola and Rhodesia in the south. The range of temperature here is high; *e. g.*, *Timbuktu* has a range of 24° F., (94° F., June; 70° F., December).

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Kano (Nigeria)	0	0	0·1	0·5	3·2	4·8	6·9	11·3	5·0	0·4	0	0	32·2
Salisbury (Rhodesia)	7·5	8·0	5·0	0·8	0·2	0	0	0	0·5	1·2	3·9	6·0	33·1

Do you find any difference between the two places in the season of rainfall?

(3) **The Desert or 'Little Rain' Belt:** This belt which is dry at all seasons lies along the High Pressure Belts in the north and in the south. In the north it includes the whole of the Sahara which stretches right across the continent, but in the south it is confined to a narrow strip along the west coast. In the desert the differences between day and night and between winter and summer are very marked: the low night temperature is due to rapid radiation of the day's heat in the dry atmosphere. Compare *Cairo* and *Port Nolloth*; here again you find a reversal of the seasons;

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Cairo	0·3	0·2	0·2	0·2	0	0	0	0	0	0·1	0·1	0·2	1·3
Port Nolloth	0	0·1	0·2	0·2	0·4	0·3	0·2	0·4	0·2	0	0·2	0·1	2·3

(4) **The 'Mediterranean' or 'Winter Rain' Belts:** This belt has hot dry summers and mild wet winters, and includes the Atlas Region and the district round Cape Town. Compare *Algiers* and *Cape Town.*

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Algiers	4·2	3·5	3·5	2·3	1·3	0·6	0·1	0·3	1·1	3·1	4·6	5·4	30·0
Cape Town	0·7	0·6	0·2	1·8	3·9	4·4	3·5	3·3	2·2	1·6	1·1	0·8	24·3

(5) **The Eastern Highlands or Plateau of Lakes:** This region lies to the east of the Congo Basin. Though it lies about the equator it is cooler on account of its elevation. It has also a double rainfall maximum, but the rainfall is not so heavy as in the Congo Basin. Hence this region is well suited to European settlement. Refer to the temperature of *Nairobi* (5,450 ft.). Study its mean monthly rainfall given below:

J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year
1·9	4·2	3·7	8·3	5·2	2·0	0·8	0·9	0·9	2·0	5·8	3·5	39·9

Compare this with any place in the Congo Basin.

(6) **The South African Plateau between the Desert and the East Coastal Mountains:** This is hot in summer and cool in winter. It gets some rain in summer. Rain decreases from east to west; *e.g.*, *Pretoria* (25·9 in.), *Kimberley* (18·2 in.). Much of this area lies above 4,000 ft. in elevation.

(7) **The East Coastlands:** These can be split into two distinctive regions:

(*a*) From the equator up to 10° S. L. Here the temperature is hot and rain falls throughout the year. Therefore this part has the same climate as the Guinea Coast. Refer to the temperature of *Mombasa.* Its mean annual rainfall is 47·3 inches. It has a double rainfall maximum and so comes under the equatorial belt.

(*b*) South of 10° S. Lat. including *Mozambique* and *Natal.* The Coastlands have a very warm climate influenced by the warm Mozambique current. This area gets fairly heavy rainfall, especially in summer, on account of the south-east trade winds. Mozambique has a mean annual temperature of 79·2° F. and a rainfall of 39·3 inches, of which 33·6 inches fall in southern summer (November to April). Further south, *Durban* has a mean annual temperature 70·8° F. Its mean annual rainfall of 39·7 inches is distributed all over the year, the winter rain being the least.

EXERCISES

(1) Construct a diagram to show the mean monthly temperatures (° F.) of Algiers and Cape Town. Account for the difference you note.

	J	F	M	A	M	J	J	A	S	O	N	D
Algiers	53·4	55·4	57·6	61·0	65·8	71·4	77·0	77·5	74·8	68·5	62·4	55·6.
Cape Town	69·3	69·7	68·0	63·1	58·9	55·5	54·8	55·6	57·0	60·7	64·2	67·3.

(2) To note that temperature is modified by altitude compare by a diagram the mean temperatures (° F.) of Mombasa (50 ft.) and Nairobi (5,450 ft.) in Kenya.

	J	F	M	A	M	J	J	A	S	O	N	D
Mombasa	79·9	80·3	81·8	80·6	78·4	76·5	75·3	75·7	77·0	78·4	79·4	79·9
Nairobi	63·8	64·7	65·2	63·9	63·4	61·6	58·5	59·3	61·6	64·8	64·0	62·3

Note at Nairobi the temperature is high in March and October and low in July and December. Acccount for this.

(3) Compare by a diagram the mean temperatures (° F.) of Freetown and Timbuktu. Account for the difference in the range of temperature of the two places.

	J	F	M	A	M	J	J	A	S	O	N	D
Freetown	80·9	82·0	82·2	82·0	81·5	79·5	77·6	77·4	78·5	80·2	80·5	81·4
Timbuktu	71·1	73·6	83·1	91·6	94·5	93·7	89·2	86·5	89·2	88·9	80·8	71·1

(4) Which area in Africa would be best suited to which people? Why?

(5) Why do the isotherms of South Africa bend northward and then southward when the western coast-line is crossed?

(6) "The Equatorial area is not the hottest part of Africa." Why?

(7) With the help of the isotherm maps, calculate above what height Mt. Kenya will be covered with perpetual snow.

(8) Account for the 'low pressure belt of calms' at the equator and 'high pressure belt of calms' at 30° N. and S. Lat.

(9) Why is the former belt rainy and the latter dry?

(10) Explain: "In the tropics the rain follows the sun."

(11) What is meant by "Mediterranean" climate? Which parts of Africa have such a climate? Why?

(12) "Equatorial regions have a double rainfall maximum." Explain and illustrate.

(13) Why has Madagascar heavy rainfall on its east coast?

(14) Will many people live in the "Horn of Africa"? Give reasons for your answer.

(15) Why does the Orange become shallow towards its mouth?

(16) "The climatic belts of the west side of Africa are arranged symmetrically on both sides of the equator, but in reverse order." Explain.

(17) Draw diagrams to represent the mean monthly rainfall of the four pairs of towns given in the lesson, one for each pair.

(18) The following table gives the climate data for Alexandria, Lagos, Aswan, Pretoria and Beira. State which of these towns the letters A, B, C, D and E represent. Give reasons for your answer:—

Places	Warmest month	Coolest month	Range of temp.	Mean Annual Rainfall in inches	Notes on seasonal distribution of rainfall
A	79° F (July)	77° F (Jan)	2° F	70	All seasons especially summer.
B	72° F (Jan.)	52° F (July)	23° F	26	Mainly in summer.
C	93° F (July)	60° F (Jan.)	33° F	0	Little at any season.
D	81° F (Aug.)	58° F (Jan.)	23° F	8	Mainly in winter.
E	81° F (Jan.)	69° F (July)	12° F	60	Most rain in summer.

CHAPTER IV

NATURAL VEGETATION, NATURAL REGIONS AND ANIMALS

NATURAL VEGETATION

In a hot country like Africa, as in India, plant life largely depends on rain. There is forest where rain is abundant and desert where it is scanty or almost nil. Between these two lie grasslands. Compare the maps showing mean Annual Rainfall (Fig. 14) and Natural Vegetation (Fig. 15)

(1) Corresponding to the Equatorial Belt of constant rains, there is the *Equatorial Forest.* This is found on the Guinea Coast, in the Congo Basin, and along the east coast of Equatorial Africa and Madagascar.

(2) Corresponding to the Tropical Summer Rain Belts, there are the *Tropical Grasslands* or *Savannahs*, which surround the Equatorial Forest on the north, east and south. The East African Highland or Plateau of Lakes (climate region 5), though lying on the equator, has, as we have seen, only a moderate rainfall. Therefore the vegetation there is of the savannah type and not of the forest type. It is a connecting link between the northern and southern savannahs. The central plateau of Madagascar and the lower slops of the Abyssinian Highlands are also savannahs.

(3) Northwards and southwards the savannahs pass very gradually through an intervening *scrubland* into

desert—the Sahara in the north and the Kalahari in the south, which are rainless.

(4) North of the Sahara and south of the Kalahari the deserts merge gradually into scrublands which in turn change to the "*Mediterranean*" Vegetation of the Atlas Region in the north and the Cape Region in the south-west corner. This corresponds to the "winter rain" belt and consists of evergreen trees and shrubs which are adapted to the conditions of summer drought.

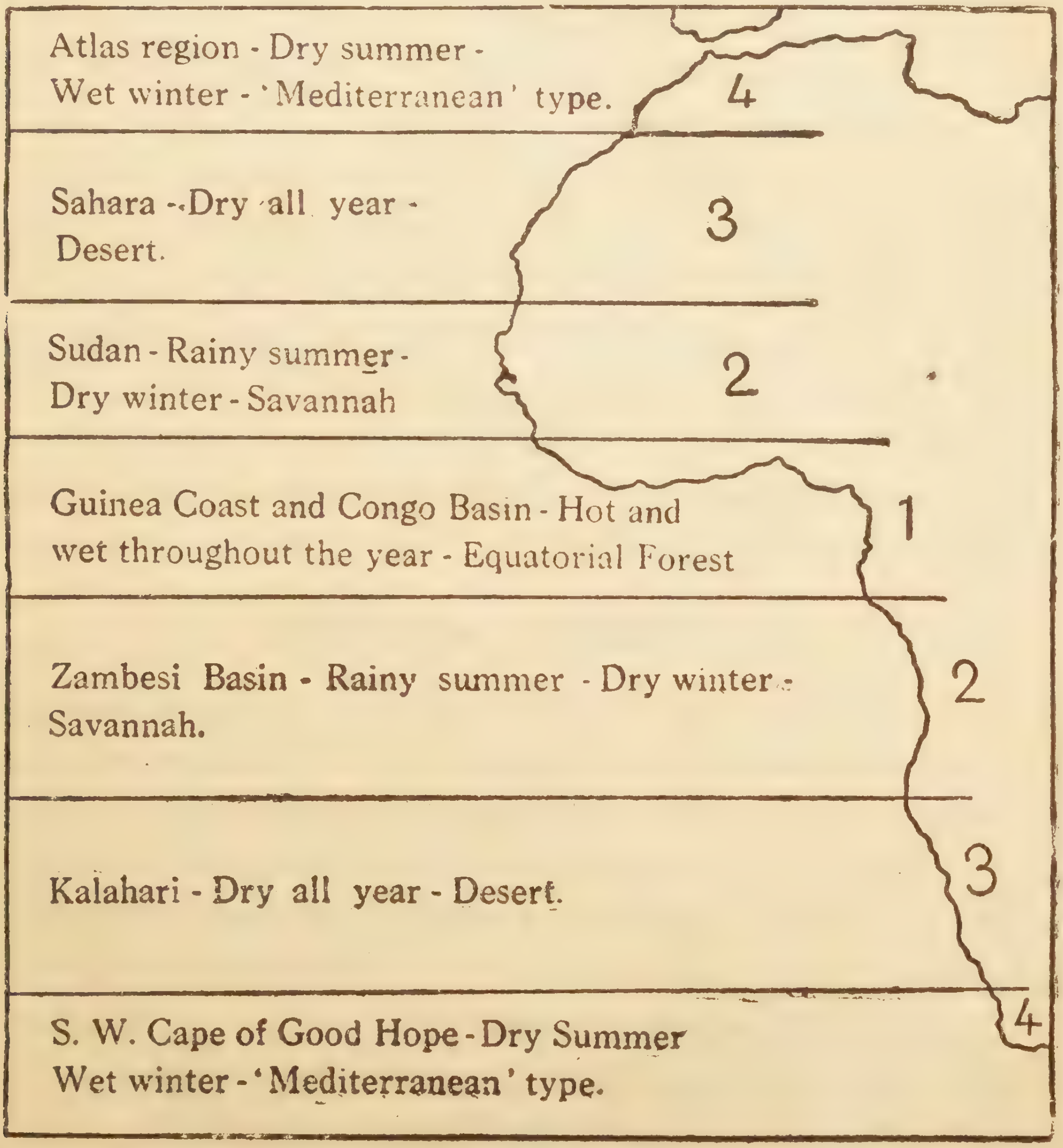

Atlas region - Dry summer - Wet winter - 'Mediterranean' type.
4
Sahara - Dry all year - Desert.
3
Sudan - Rainy summer - Dry winter - Savannah
2
Guinea Coast and Congo Basin - Hot and wet throughout the year - Equatorial Forest
1
Zambesi Basin - Rainy summer - Dry winter - Savannah.
2
Kalahari - Dry all year - Desert.
3
S. W. Cape of Good Hope - Dry Summer Wet winter - 'Mediterranean' type.
4

FIG. 16
Symmetry in climatic and vegetation belts on the west side of the continent of Africa

Thus in the natural vegetation of Africa, especially on the west side, we find the same symmetry as we find in the rainfall. Study figure 17. Remember that, with decreasing rainfall, vegetation *gradually* changes from forest to savannah, from savannah to scrub, and from scrub to desert.

(5) Corresponding to climatic region (6) there is the *Temperate Grassland* of the south-eastern portion of the South African Plateau, known as the *Veld.* (*cf.* the grasslands of the Murray-Darling Basin).

(6) Corresponding to climatic region (7*b*) there are *Warm Temperate Forests* especially on the coast lands of Natal; *cf.* the coastal belt of New South Wales. The northern half of this climatic region has tropical monsoon forests. (*cf.* North coast of Australia.)

Cool Temperate Forests occur on the higher slopes of the Abyssinian Highlands and the Mountain Peaks of the Lake Plateau. Above these up to the *snow-line* there is Alpine or high-mountain vegetation, and above the snow-line there is perpetual snow.

NATURAL REGIONS

Study figure 18. You will find a close correspondence between the natural regions and the climatic and vegetation belts. The areas under each natural region have the same physical and climatic conditions and, therefore, have the same type of natural vegetation. Hence the natural regions of Africa are :

(1) The Equatorial Forest ;
(2) The Summer Rain Region of Savannah ;
(3) The Hot Desert and Scrub ;
(4) The "Mediterranean" Region ;
(5) The Mozambique (Portuguese E. Africa) Region

or Tropical Monsoon type: (northern half of Climatic Region 7b.)

(6) Warm Temperate Natal Region; (southern half of Climatic Region 7b);

(7) The Temperate Grassland or Veld; (Climatic Region 6 and Vegetation region 5).

Let us now consider in detail the climate, vegetation, animals and occupations of each of these natural regions. (*Vide* also FIG. 28 showing productions.)

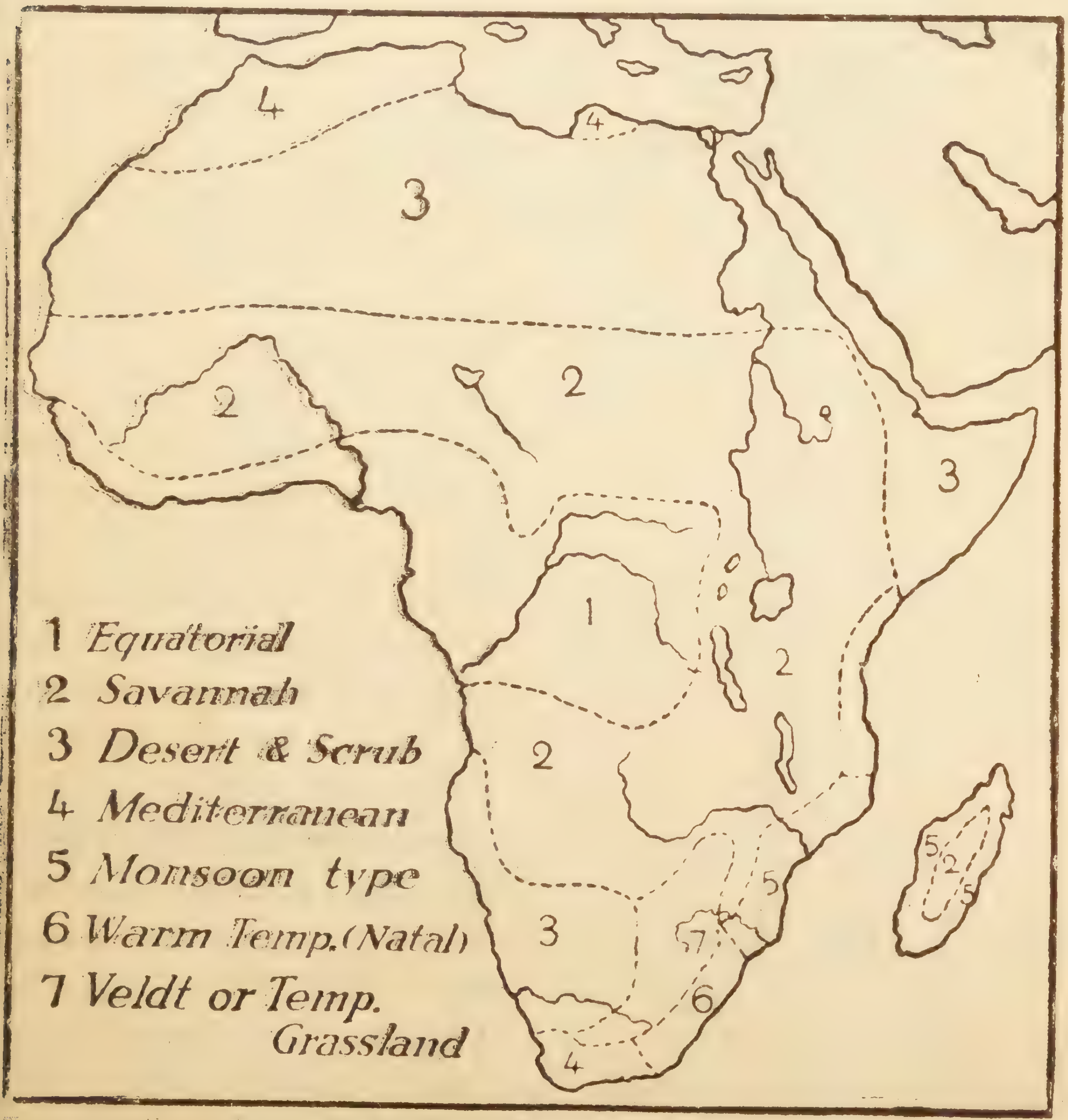


FIG. 17. Natural Regions

(1) **The Equatorial forest:** This is found in the Guinea Coast, the Congo Basin and along the East Coast of Equatorial Africa and Madagascar where the temperature is high and rainfall is heavy. Huge trees with dense foliage and great creepers make the forest almost impenetrable. The animals that are found in the forest are those that can live in the rivers like the crocodile and the hippopotomus, those that can crawl like the snake, and those that can live on the branches of trees like the monkey. Many man-like apes like the gorilla and the chimpanzee are found here. There is an abundance of birds and insects. The elephant, though it can force its way through the forest, is generally found on the outskirts. This region is not a healthy place where man can settle and live comfortably; for in the low swamps are swarms of mosquitoes which cause malaria, yellow fever and other tropical diseases. The only people that live in the Congo forest are the *Pygmies*, a short race of people leading a wretched life. But this region is a rich treasure-house of raw materials, *rubber, palm-oil, copra,*

FIG. 18. Oil Palm

cocoa and *ivory* being exported in large quantities. Rubber is the chief product of the Congo Basin, and palm-oil that of the Guinea Coast. This oil is obtained from the nuts of the oil-palm (Fig. 18) and is particularly suited for making soap and candles.

(2) **Savannah or Park Land**: This extends from Sudan to Rhodesia encircling the wet forest. Here there is rain only in summer followed by a long drought. This condition is favourable only to the growth of grass and certain kinds of trees. The trees are not continuous as in the Congo Basin, but grow in clumps here and there. The commonest tree in this region is the *baobab* (Fig. 19). Another tree is the euphorbia which resembles a bunch of scorpions with their tails in the air" The grass often

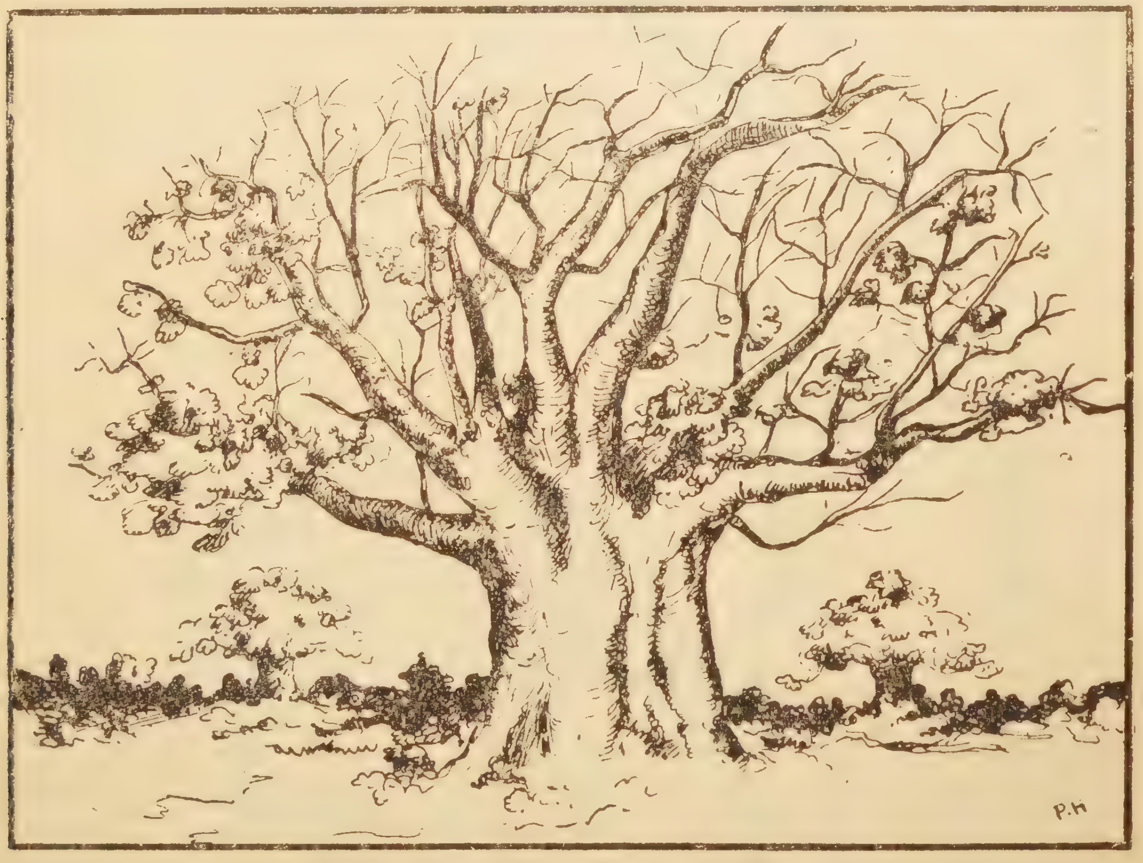


FIG. 19. The Baobab Tree

This tree, whose trunk sometimes measures 100 ft. in circumference, is the king of African trees. It is a deciduous tree, bare of leaves for many months in the year.

attains a great height of about 7 or 8 feet ; and as there is a good supply of it, there are several grazing animals like the antelope, the giraffe (Fig. 20), the buffalo, the zebra (Fig. 21) and the rhinoceros. Hence there are many flesh-eating animals also like the lion, leopard, hyena and jackal.

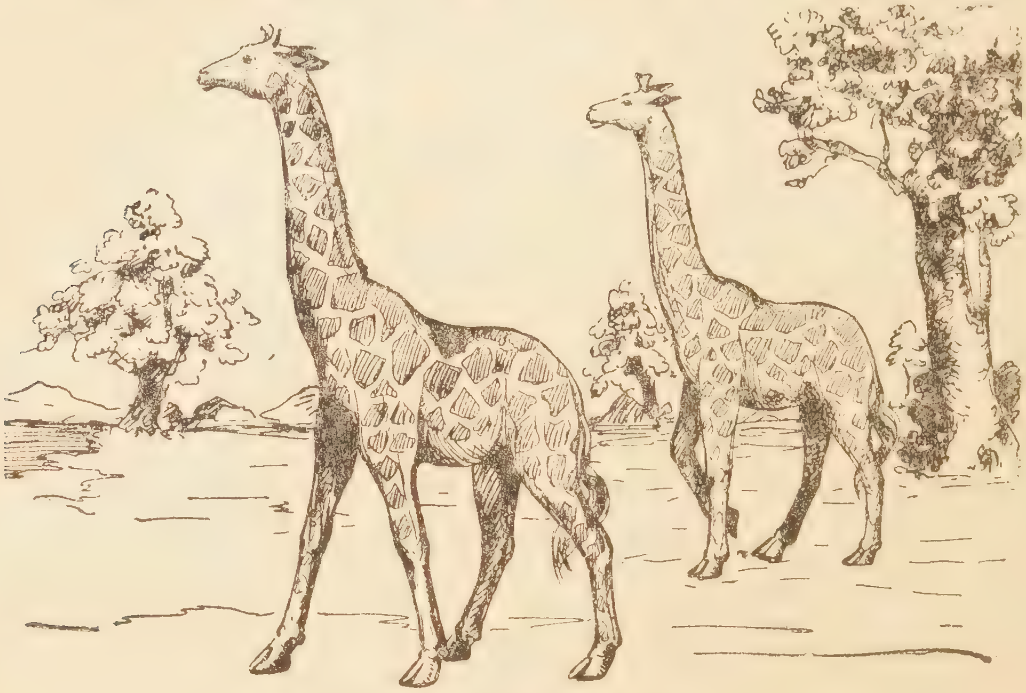


Fig. 20. The Giraffe

(Its long neck enables it to browse on tall trees. Note that its forelegs are longer than its hind legs.)

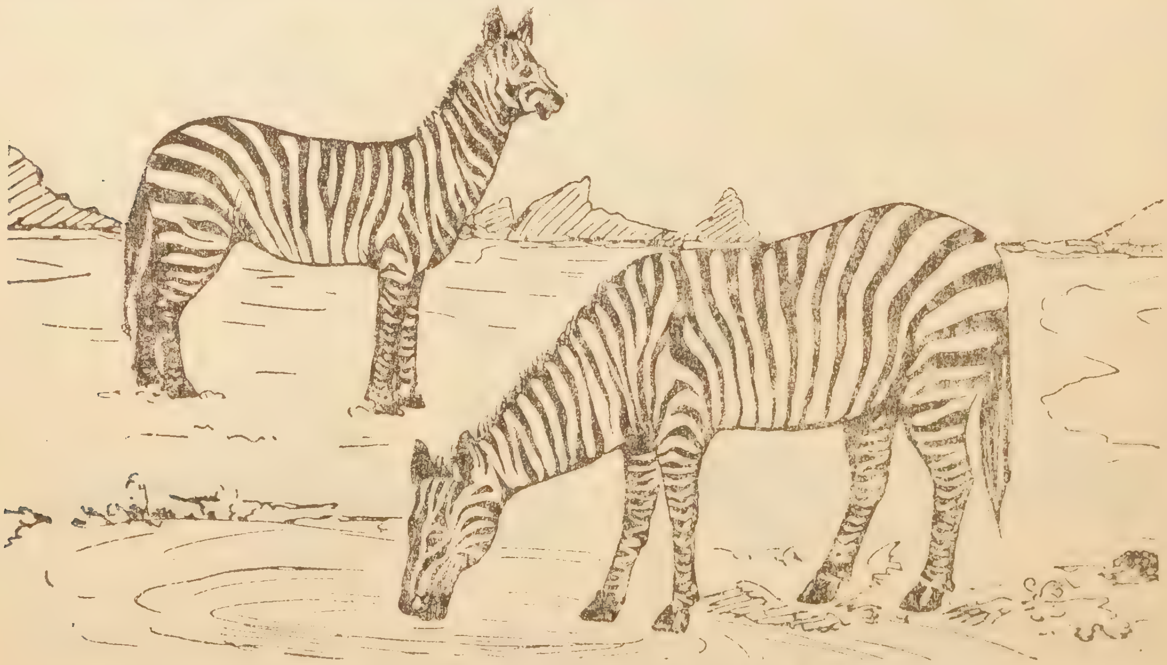


Fig. 21. The Zebra or Striped Horse

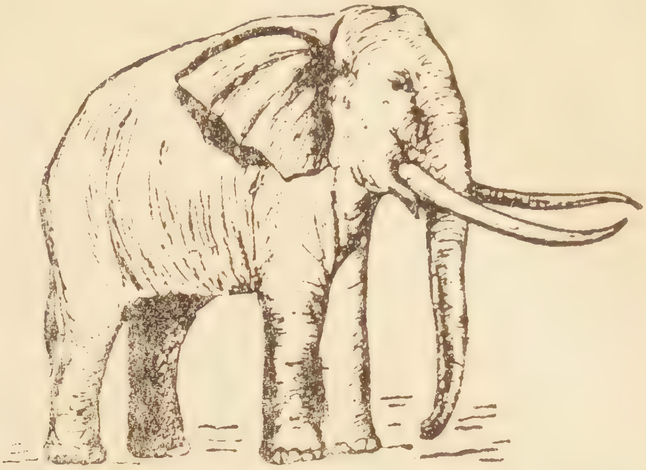


FIG. 22. The African Elephant. Note its broad ears and long tusks.

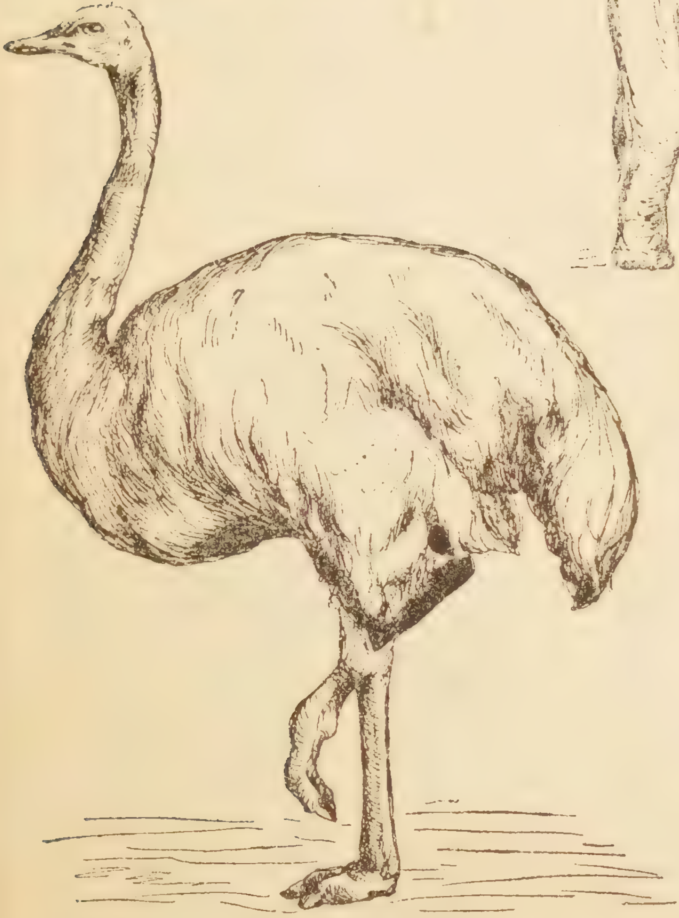


FIG. 23. The Ostrich

(It stands 7 ft. high on its long legs and can run as fast as a race horse.)

Elephants (Fig. 22) live on the borders of the forest and the hippopotamus and the crocodile live in the swamps of river banks and lakes. Of birds the wingless *ostrich* (Fig. 23) is the most notable. Insects are numerous, some of them being dangerous. The termite or white ant destroys everything but stone, metal and the hardest wood. These ants rear very hard earth-heaps often reaching a height of 20 feet. The locusts are regular pests which at times devour all the vegetation in a district. The *tse-tse fly* (Fig. 24) is fatal to cattle and horses, and carries disease germs causing sleeping sickness in man. The Savannah is the home of millions of Negroes who keep herds of cattle and flocks of sheep and goats, and grow crops of millet, rice maize, tobacco and cotton. The largest industry on the plateau in the south is cattle-rearing for meat and hides ;

much of the meat is used in the mining districts. However there is no cattle-farming in the Zambesi basin, because of the tse-tse fly. Every night the animals are driven home and shut up inside wooden fences to protect them from beasts of prey like the lion. Near the desert the life of the people is nomadic, while towards the forests it is settled. The climate of Sudan is not so healthy as to make white settlement possible; but in Southern Rhodesia and the Plateau of Lakes much of the land is at a high level above the limit of malarial fever and so the climate is healthy and suited to white people. Here European fruits and cereals are therefore cultivated.

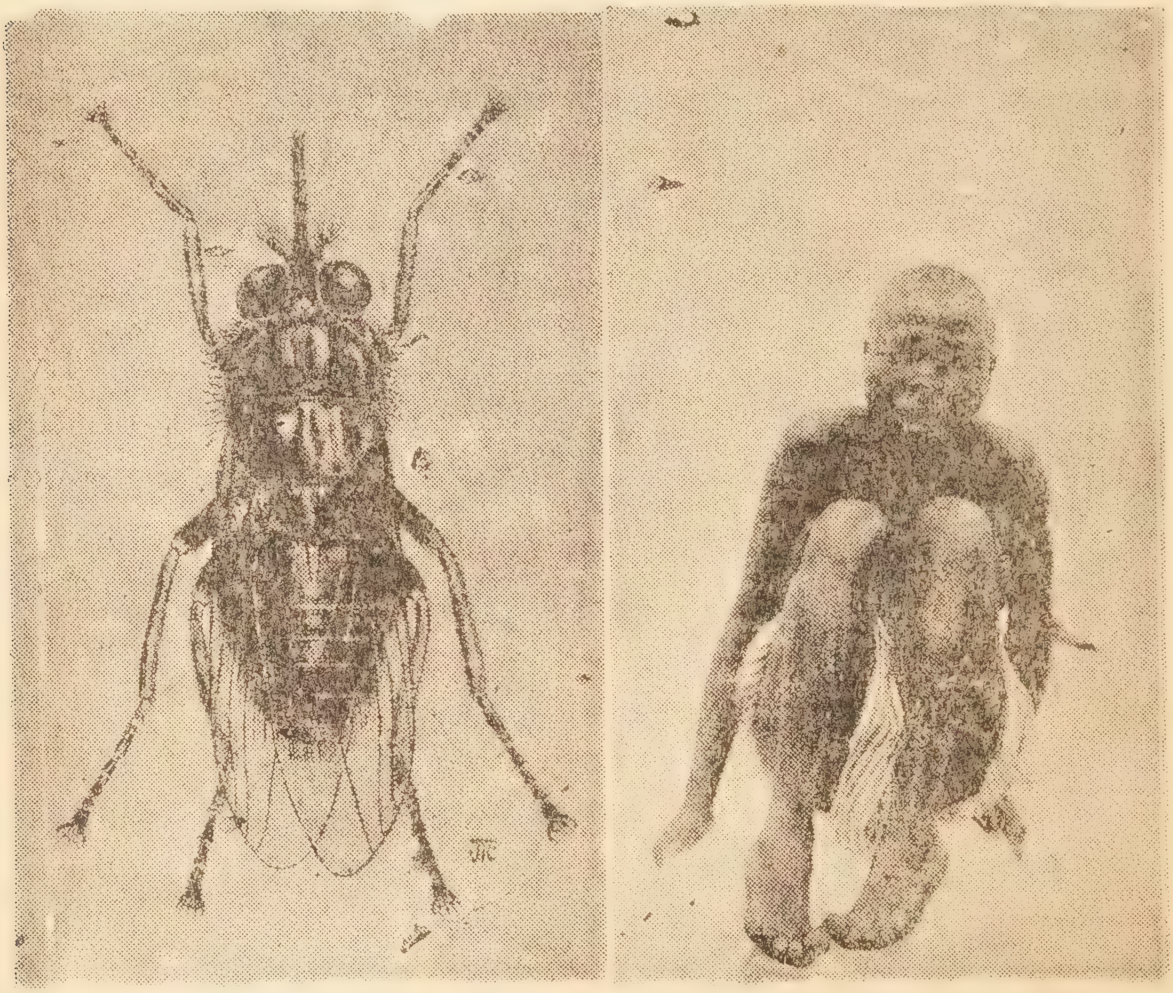


FIG. 24. Tse-Tse Fly. A man affected by Sleeping-Sickness.

(3) **The Desert:** This is a region where rain seldom falls. This lies about the tropics—the Sahara lying about

the Tropic of Cancer, and the Kalahari about the Tropic of Capricorn : *c.f.* the great Australian desert. Between the desert and the Savannah lies the *scrubland* having coarse grass, dwarf acacia, and prickly shrubs. In some parts, especially in Somaliland, gums and aromatic shrubs, such as frankincense, are of economic importance.

The *Sahara* is a typical desert. The word Sahara is derived from the Arabic *Sahara* meaning 'an uninhabitable waste.' The Sahara is the largest continuous desert in the world. It is not simply a great expanse of sand, for it has a variety of features—sand-dunes, rocky plateaus, mountain ranges, and valleys. The sand of the desert is due to the weathering of the surface rock on account of rapid expansion and contraction caused by the sudden changes of temperature from day to night. Sometimes the day temperature goes above 120° F., and the night temperature falls below freezing point. The *soil of a desert is fertile, but, owing to lack of moisture, nothing grows there.* Where water is available "the desert blossoms as a rose."

In this desert, thunder-storms sometimes occur; and the water sinks below the surface and reappears at the sides of depressions as in an artesian well. These depressions are called *oases*. In the Algerian Sahara, the French have created oases by sinking artesian wells. An oasis may sometimes contain many villages. The *date palm* is the most valuable plant; but rice, wheat, barley, millets, vegetables and fruits can be grown. But in the true desert there are only thorny plants and coarse grasses that can, by means of their thick skins and the small size of their leaves, prevent the loss of moisture they contain.

In the oases settled life is possible, and the main occupation of the people is farming. Other occupations are the drying of dates, the weaving of clothes and woollen blankets and the making of mats and baskets of palm leaves. But in the desert proper settled life is not possible. The *Bedouin Arab* is a nomadic tent-dweller. His occupation is keeping camels, goats and sheep. He is also engaged in guiding caravans from oasis to oasis. Sometimes he earns his living by plunder.

The *Nile Valley* which lies in the desert belt is a long, narrow strip of oasis, and is made fertile by irrigation.

Irrigation in Egypt is of two kinds: (1) *flood irrigation* and (2) *perennial irrigation*. Flood irrigation obtained in olden days. It consisted in dividing the land on either side of the river into a number of basins by means of dykes of earth, and connecting them with the river by shallow canals; when the river was in flood the water overflowed the banks and passing along these channels filled the basins. There it was allowed to remain for several days so that each basin was covered with a rich deposit of silt. But by this system, only one crop could be raised *i.e.*, in winter, for in summer the ground would be baked hard and cracked by the heat of the sun. Therefore people had to lift the water from the river during the dry season by hand or animal labour. The water-wheel turned by the ox and the *water lift* or (*shaduf*) worked by man are still in use. Under the British administration of Egypt dams and barrages have been erected across the river: *e.g.*, the great dam at Aswan (1¼ miles long) and the barrages at Esna, Assiut and Zifta. These works have made *perennial irrigation* possible. These dams convert the river into great reservoirs from which water is led through canals to irrigate the fields. But this system has one disadvantage. All the silt is deposited in the reservoirs behind the dams, and so the fields have to be manured artificially.

Cotton is the most important crop. Sugar-cane and rice are also cultivated in summer. In the flood season maize and millets are grown and in winter, wheat, barley and pulses.

On the desert margins the chief animals are goats and camels The camel, " the ship of the desert," is the only animal that can cross the desert ; for it can live without food and water for several days. The Sahara forms a great barrier which has kept the animals south of it distinct from those of Europe.

The Kalahari, "the great Thirst-Land", is one-tenth the size of the Sahara. It is more a scrubland than a desert. The rain that falls here gathers into pools at which flocks of goats are watered. Some parts have coarse grasses and thin woods of thorny acacia. It is believed that by sinking wells, the Kalahari may be reclaimed to prosperity. The real desert is restricted to a narrow strip along the west coast.

The " Horn of Africa " or Somaliland, being a dry area, is a scrubland. Gum, myrrh and frankincense are the chief products. The camel and the donkey are used for transport.

(4) **The " Mediterranean " Region or Region of Winter Rain :** This includes the Mediterranean coast of Africa and the S. W. corner of Cape of Good Hope. It lies between the constant trade wind belt and the constant west wind belt. Here in summer the trade winds blow and so there is no rain, but in winter the westerlies blow and give rain. Therefore, here the summer is hot and dry and the winter mild and rainy. This kind of climate is known as the '*Mediterranean Climate*' for it obtains in the countries round the Mediterranean sea. The plants here have to be protected from loss of moisture during the summer drought. Hence plants with thick leathery leaves

like the olive and the fig, or thick barks like the cork-oak, grow here. Plants like the vine have deep roots which can obtain moisture from great depths. Some plants have bulbous roots as tulips, and are therefore able to store up moisture. There is very little grass, and therefore there are few cattle ; but sheep and goats are common. The hot dry summer is favourable for the growth of grains like wheat and maize, and fruits like the orange, lemon, fig, olive, mulberry, grape and almond. Soap-making, silk manufacture, wine-making and fruit-canning are the chief industries connected with these products.

(5) **The Mozambique Region:** The fifth natural region is fouud on the east coast south of the equatorial belt and almost falls within Portuguese East Africa, also known as Mozambique. Hence it is called the *Mozambique Region*. It has *a hot monsoon type of climate* and may be compared with the coastal belt of north Australia and the wet coastal lands of south-eastern Asia. The climate is hot, and rainfall, though it is confined to the summer, is heavy enough for the growth of tropical forests. (*Vide* rainfall of Mozambique and Beira). The climate of most of this region is not suited to white men, for the lowlands are infested with the tse-tse fly and the malaria-carrying mosquito. This is a region of plantations, where sugar, ground-nuts, maize, cocoanuts, rubber and tobacco are grown.

The coastal margins of *Madagascar* are also included in this region. The eastern slopes receive very heavy rains from the S. E. trades ; and the rainfall is less in the interior and on the western coests. There is forest on the eastern slopes and over most of the coast lands, while the interior is largely savannah. Cattle-rearing aud cultivation are the chief occupations, rice being the chief cultivated product. The chief animals are *lemurs* which resemble small monkeys and live in trees. In the highlands the people keep humped cattle.

(6) **The Natal Region** or *Warm Temperate Eastern Margin.* This includes the province of Natal and also the eastern part of the Cape of Good Hope. The rain falls at all seasons, it being heaviest in summer and least in winter. The region rises from the coast by terraces to the high plateau, and so vegetation varies according to height. In the coastal belt palms, pine-apples and bananas are found. What is this tropical condition due to? Tropical crops like cotton, sugar, tea, maize and tobacco are cultivated. In the 'midland' belt, maize, millet, root crops and wattle, introduced from Australia, are grown. In the higher or upland belt, the rearing of sheep, cattle and horses is of greater importance. What part of Australia does this resemble?

(7) **The Veld or Temperate Grassland:** This resembles the Murray-Darling Basin as it lies in the rain-shadow behind the Drakensberg. This country is often divided into three regions which differ in altitude and, consequently, in climate and vegetation :—

(i) In the east is the treeless grassland or *High Veld* which includes land over 4,000 feet high—*e.g.*, the neighbourhood of Pretoria and Johannesburg. The climate is cool and dry. Cattle-rearing is the chief occupation; sheep also flurish here. Irrigation is now being increasingly employed to bring the land under cultivation. But the chief development of this region is due to its minerals. The whole of Orange Free State and the southern portion of Transvaal come under this region.

(ii) The second type is the park-like *Bush Veld,* from 2,000 to 4,000 feet in elevation. This is warmer than the High veld and has more growth of bushes and trees. Stock-raising is important here also, but the country is also suited to the growth of maize, tobacco and fruits like oranges and pineapple. The rainfall is scanty and uncertain and therefore irrigation is neccssary. This includes the central part of Transvaal.

(iii) *The Low Veld*, below 2,000 feet in height, includes the northern portion of Transvaal and the Limpopo Valley. It is hot and its natural vegetation is almost tropical: cotton, coffee, rice, tobacco, sugar-cane and bananas can be grown.

The Veld, especially the High Veld, is usually healthy alike to man and beast, "because the short growth of the vegetation and the absence of forest gives no harbourage to flies and mosquitoes" which are the carriers of disease germs.

(8) **The Karroo Region of the Cape of Good Hope:** This lies behind the mountain rim and has a rather scanty rainfall. It is therefore a poor pasture land. Sheep and goats thrive here. The ostrich, being by nature a desert-dweller, does best in the Karroo. Ostrich-farming is an important industry in the Cape of Good Hope, the centre of the industry being in the Little Karroo, near Oodtshoorn. The ostrich is kept for its feathers.

EXERCISES

(1) Name the chief Vegetation Zones on the west margin of Africa and point out their resemblance to the climatic belts

(2) With reference to the Equatorial forest and the Desert show that vegetation depends upon climatic conditions.

(3) Name some of the chief characteristics of "the Mediterranean" type of vegetation.

(4) What animals are found in the Equatorial Forest Region? Why?

(5) What is "Savannah"? Why is it called "Park-land"? Why is the "Plateau of Lakes" included in this region?

(6) "The insects of Africa are often dangerous"; Justify this statement.

(7) Why is there no cattle-farming in the Zambesi basin?

(8) Account for the sand of the desert. How is this different from the sand of river beds?

(9) Give an account of the life of the people in the desert.

(10) Why is the camel called the 'ship of the desert?'

(11) Show with reference to the "Natal Region" that vegetation varies with altitude.

(12) What region of Australia does the 'Veld' resemble? Why?

(13) "The High Veld is healthier than the Savannah or forest." Why?

(14) Write short notes on "baobab", "palm oil, and "wattle."

CHAPTER V

PEOPLES, PRODUCTIONS, OCCUPATIONS AND COMMUNICATIONS

THE RACES OF AFRICA (FIG. 25)

The present inhabitants of Africa belong to two great groups, the Black races of the south and the White races of the north, the two being separated by the broad Sahara desert.

The people of the north are known as *Hamites* and *Semites*, who came to Africa from Western Asia either by way of the Isthmus of Suez or from the south-western extremity of Arabia. The Hamites were the earliest inhabitants of North Africa and they include the agricultural *Berbers* of the Atlas Region, the *Tuaregs* of Western Sahara ("the banditti of the sands"), the *Fellahin* or peasants of Egypt, the *Gallas* and *Somalis* of the Eastern Horn of Africa. The Semites are chiefly the Arabs of the north and north-west, who came much later in the seventh century A.D. They spread all over Northern Africa by means of their horses and camels, and explored much of the Sahara establishing caravan routes linking the oases. The *Moors* of the Altas Region who inhabit the towns are of mixed Berber and Arab race. The descendants of the Arabs are mostly called *Bedouins* to-day. The *Abyssinians* are mostly Hamites, but they have been so much influenced by Arab invaders that their language is Semitic. The Hamites can be distinguished from the

Semites by their darker skins, coarser features, and less elongated faces. All these are Mohammedans, except the Abyssinians who profess a form of Christianity. Thus we see that Northern Africa, whose physical and climatic conditions are similar to those of Southern Europe, really forms part of Western Asia in social and cultural conditions.

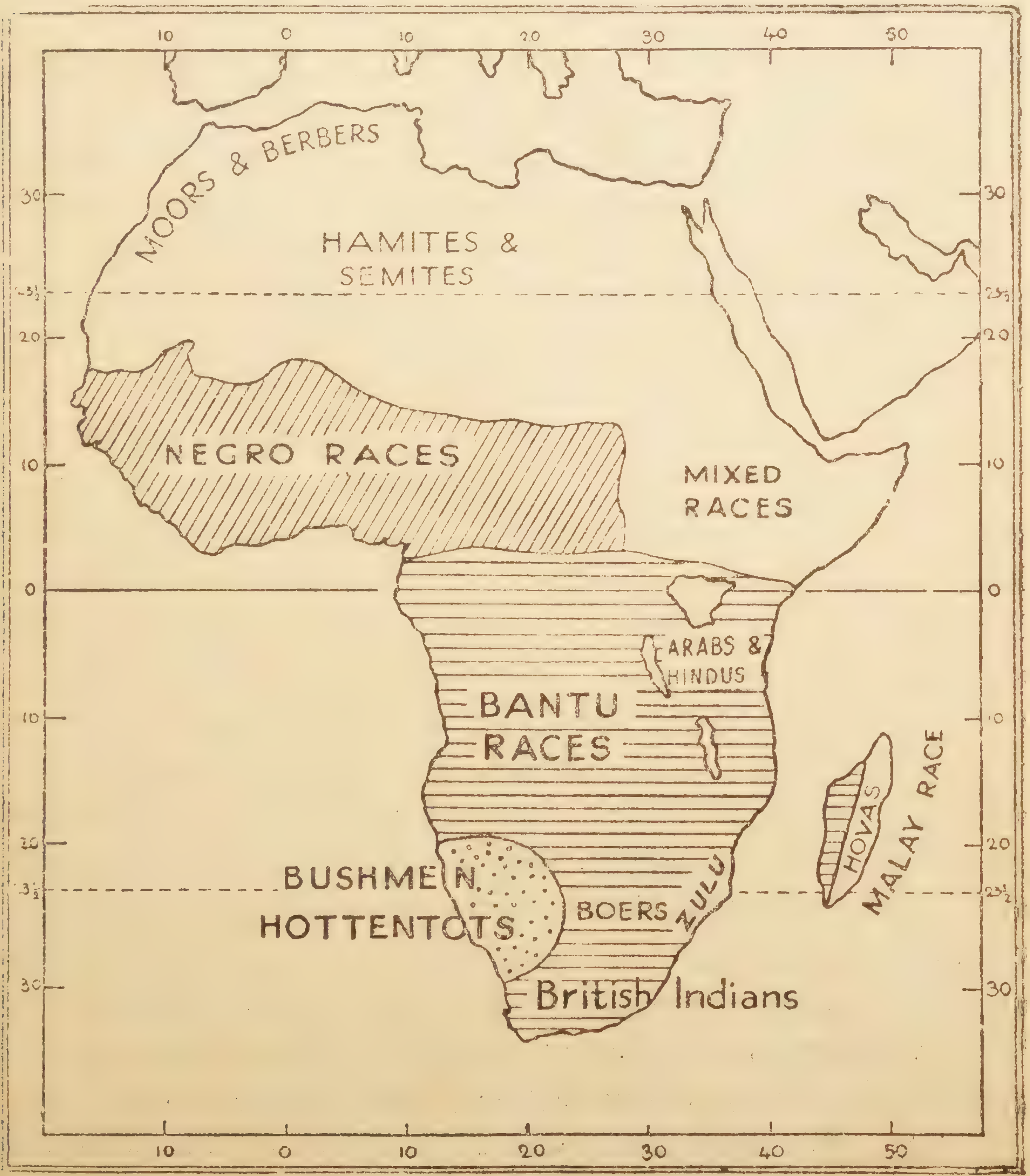


FIG. 25. The Races of Africa

South of the Sahara live *the Negroes*, "the eldest children of the sun." They have a black skin, black curly hair, a broad nose and thick lips. Their religion and laws are at a low level. The true negroes are found in the Sudan, "the land of the blacks", and the Guinea coast. The *Hansa* tribes of northern Nigeria are the most advanced of the race and their language is used in most of the commerce of West Africa. They are traders as well as farmers and make good soldiers and police under British control. There is another tribe called the *Fulas* who are of mixed Hamitic and Negro origin. They are a pastoral people living amongst the Hansas, whom they conquered in the eighteenth century. The Hansas and the Fulas have adopted Mohammedanism. It is from the Guinea coast that large numbers of negroes were carried off as slaves to work in the American plantations.

South of a line drawn from the Gulf of Guinea to Lake Victoria live the "*Bantu*" speaking races. This group comprises many tribes speaking many dialects of the same language. One of these dialects is *Swahili*, the commercial language of East Africa. The Bantus are a mixture of negroes with Hamites or other races. They differ from the true negroes of the Sudan in being shorter and in possessing a lighter skin. The finest type of the Bantu group is the *Zulu* of South Africa. The *Bechuanas*, the *Basutos*, the *Matabeles* and the *Mashonas*—all known by the general name of *Kaffirs* (an Arab word meaning 'black people') belong to this group. The Bantus are by far better than the true negro as regards law, order and government. The occupations of the various tribes (agriculture and pasturing) vary with the region in which they live.

The *Bushmen* and the *Hottentots* of the Kalahari Region, and the *Pygmies* of the Congo forests are probably the remnants of the earliest inhabitants and have been driven to their respective areas by the pressure of the stronger Bantu races. The Bushmen are short in stature—averaging about five feet—and have yellowish-brown skin; and their hair grows in isolated tufts. The Bushman is perhaps the most debased human being on the earth. The Hottentots who are pastoral in occupation are taller than the Bushmen, and owe their origin to inter-marriages between Bantus and Bushmen.

The Pygmies of the Congo forests whose average height is about 4 feet 3 inches, have also a yellowish dark skin. They resemble the Bushmen in being descended from the primitive Africans. Their homes are mere shelters of twigs and leaves. Their only food is what little meat they can get by hunting and any wild fruit they can secure by climbing trees.

On the eastern side of Madagascar are the *Hovas*, an intelligent agricultural people belonging to the Malay race, while on the western side there are the *Bantus*.

The *Arabs* had also settled on the east coast of Africa as traders, their chief trade being in slaves and ivory.

A large *Indian* populatian is found in British South Africa and East Africa. In Kenya the Indians had settled along the coast long before the coming of the British, and they got into the interior when the railway from Mombasa to Uganda was built. They were employed as clerks and labourers in this work and now there are as many as 20,000 Indians following different professions. The heat of the coastal lowlands of Natal and the need of labour for the sugar-cane and tea plantations led to the introduction of labourers from India in that country also. But their treatment and status are still a difficult problem awaiting solution.

Of the *European immigrants*, the Portuguese were the first to explore the coastal margin of the continent in the 15th and 16th centuries; and they established trading settlements on the east and west coasts in what are still Portuguese territories, which served as places of call for ships going to India and further east. The Dutch occupied the Cape Region in 1652. In 1815 the Cape of Good Hope became permanently British, and the Dutch farmers, now called *Boers*, became British subjects. The abolition of slavery in the colony made the Dutch move inland with their stock and goods and found their own colonies. So in the Union of South Africa, the provinces of the Transvaal and the Orange Free State have a white population mainly of Dutch origin, while in Natal and the Cape of Good Hope most of the whites are British.

PARTITION OF AFRICA

Study the political map of Africa in your atlas. You will find that almost the whole of the continent has been partitioned among the various European nations. The French have colonised in the Atlas region and extended their influence over the Sahara and a large portion of the Sudan. (The British own the Union of South Africa, Rhodesia, Kenya and some of the countries on the Guinea coast.) They control the Suez Canal route to India and much of the development of the Nile lands is due to the irrigation works constructed by them when Egypt was under their control. Since the Great War, Egypt has been recognised as an independent state. The Anglo-Egyptian Sudan is practically under the administration of Britain. The greater part of the Congo Basin is under the control of Belgium, while the rest of it has come to France.

At the end of the Great War all the German colonies were entrusted to other European nations to manage "under mandate" from the League of nations. Under this arrangement German East Africa (now called *Tanganyika Territory*) has been *mandated* to Britain, German South-west Africa, to the Union of South Africa, and Cameroons and Togoland jointly to France and Britain.

To-day in the whole continent, there are only two independent countries besides Egypt: Liberia and Abyssinia. The former became the home of the slaves liberated from America when slavery was abolished there. The latter has been able to maintain its independence on account of its relief which has helped the people to resist the attacks of Europeans.

DENSITY OF POPULATION (Fig. 26)

Look at the map (Fig. 26) showing density of population in Africa. The most densely populated part is the Lower Nile Valley which has a total population of nearly 14 millions. Its density is higher than that of Bengal, being over 1000 per square mile. This dense population is due to the extraordinary fertility of the soil. The cultivated lands of Egypt are about three times more productive, acre for acre, than the average arable lands elsewhere. This fertility is due to: (1) the temperature that is suitable for the growth of most of the tropical and many of the temperate plants; (2) the constant supply of water; and (3) the soil that is perpetually renewed by the rich sediment brought by the Nile waters.

Next in density come the Niger and the Benue Valleys and the coastal margin (Tell) of the Atlas Region which are also very productive. Similar density is found in South Africa around Cape Town and other trading centres, and also around the mining centres like Johannesburg.

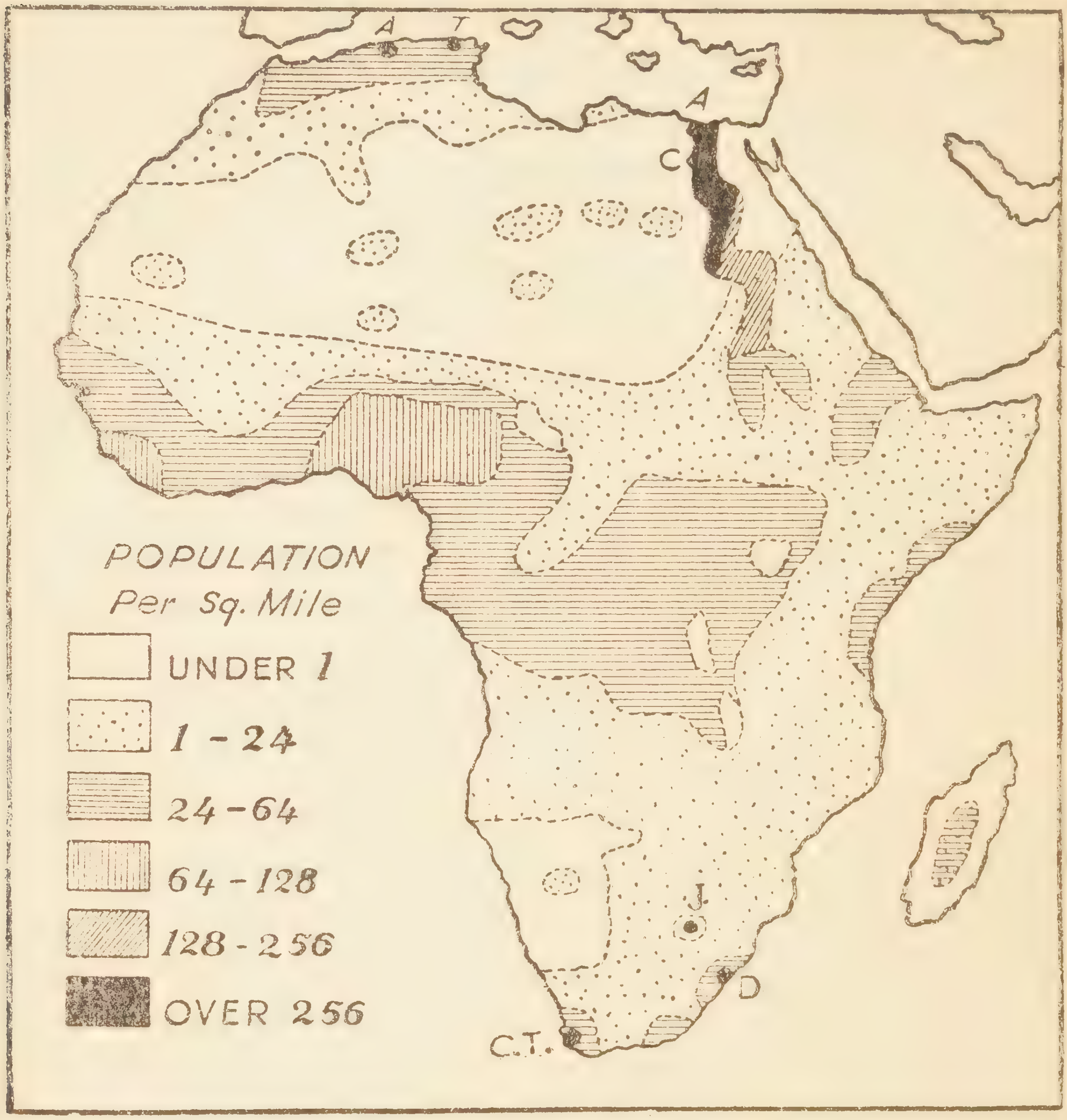


FIG. 26. Density of Population

Note the parts of Africa that have the least population, and account for the thinness.

On the whole, Africa, like Australia, is very thinly peopled, the total being estimated to be 200 millions. The reason can be easily understood by a reference to figure 27. (Nearly half the total area is taken up by forest, desert and other uninhabitable regions.) When all the cultivable lands are used, Africa may support a much larger population.

The regions that are suitable for European colonisation are the mediterranean regions of the north and the south, the temperate grasslands of South Africa and the higher parts of eastern and southern savannahs which are over 4,000 feet above sea level. The Atlas region is under the French, while the other parts are mainly under the British control. But in the hot wet equatorial and coastal regions which are subject to tropical diseases, the white man is only a bird of passage. He stays there only temporarily as an official, trader or missionary. In all the European possessions the natives are several times numerically stronger than the white settlers ; for example, in the Union of South Africa, the proportion of white to coloured people is 18 : 82. The coloured people are generally given an inferior position in the state which they are beginning to resent. The racial conflict is likely to increase, as the coloured people become more and more educated. In Australia where the natives are dwindling in number, there is no such "native problem" as there is in Africa. Can you give reasons ?

PRODUCTION AND OCCUPATION

Study fiigure 28. We have learnt something about the vegetable and animal productions of Africa in connection with the Natural Regions. Much of the continent remains yet to be developed (Fig. 27.) With the introduction of good government and cheap tansport, Africa, on account of its climatic conditions and its virgin soil, should surpass Asia or America in its output of valuable products.

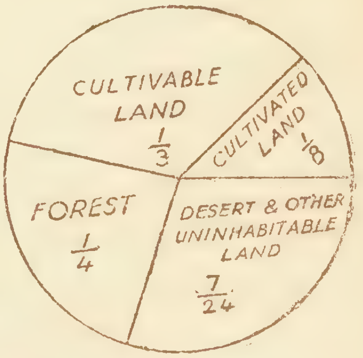


FIG. 27. Proportion of arable lands, forests etc.

The occupations of the people depend chiefly on the productions. Hence the chief occupations of the people are (1) *pasturing* in the grasslands—*e.g.*, the Atlas slopes, Sudan, East African and South African plateaus, the Veld, and the Karroos ; (2) *agriculture* in the more fertile areas where the soil is good and water is supplied either by rainfall or by irrigation—*e.g.*, the Tell, the river valleys, the coastal strips, and the Sudan (where the land is simply to be "tickled in order to make it laugh into a

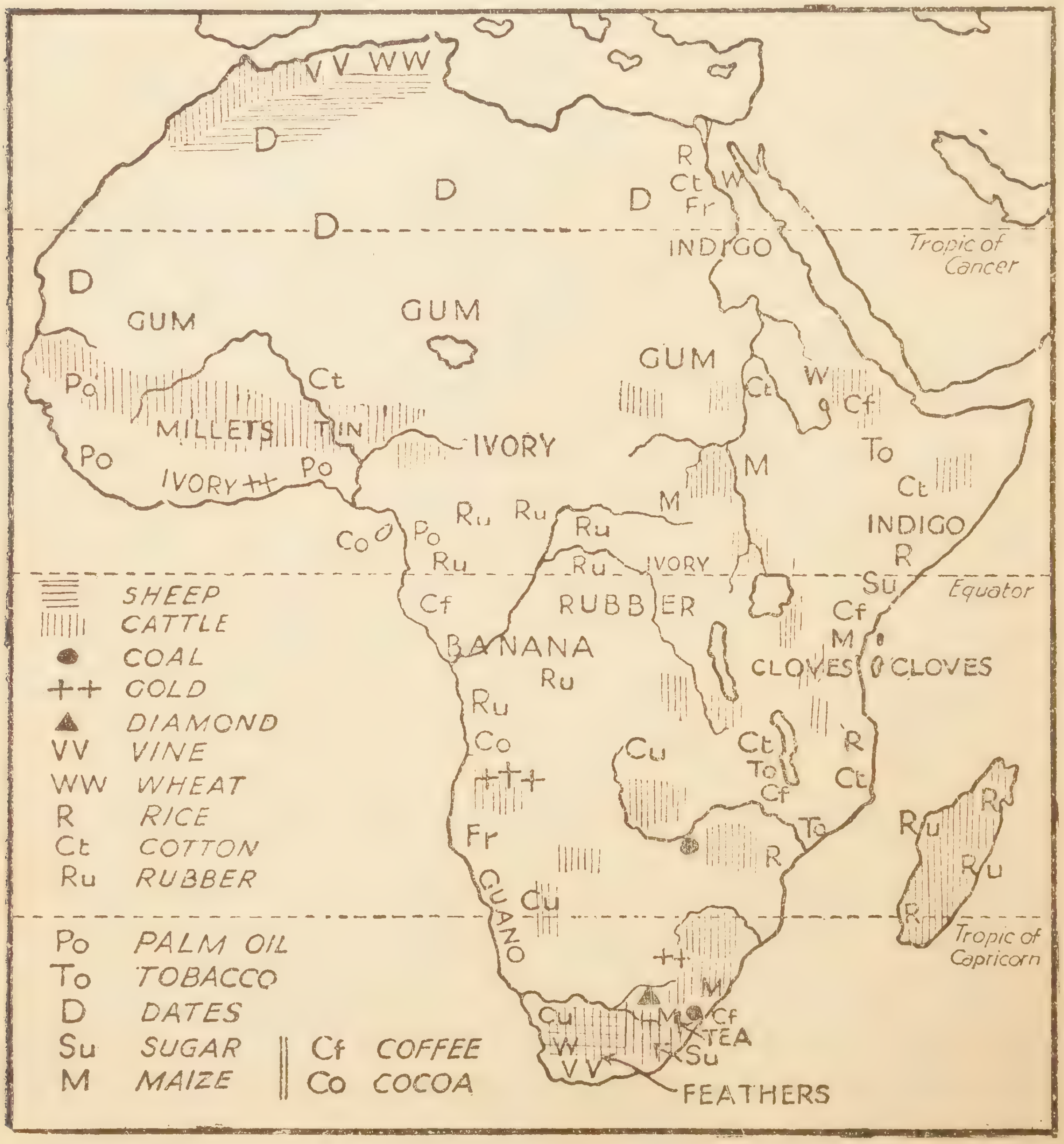


FIG. 28. Productions

harvest."); (3) *hunting* and *collection of rubber, palm kernels* and other products in the forest—*e.g.*, the Congo Basin and the Guinea coast; (4) *mining* in mineral areas.

Africa has no manufactures of any importance. The European nations are developing the interior with the object of finding additional food supplies and raw material for the manufactures of their home countries; however, there are some local manufactures carried on by the natives: *e.g.*, native leather and cotton goods of the Sudan. Where European population is the largest, as in South Africa, manufactures are unimportant; for manufactured goods are imported from the mother country in exchange for the raw products exported.

Minerals: Africa, especially the southern part, is rich in minerals. *Gold* is found in the Transvaal, Rhodesia, and on the Guinea coast. Johannesburg is the centre of the *Witwatersrand*, a ridge of gold-bearing quartz 60 miles long and 1000 ft. above the surrounding plateau. *Diamonds* are found at *Kimberley*. *Copper* is obtained from the *Ookiep* mines south of the Orange and the *Katanga* mines of the Congo Basin. *Coal* is found in the *Wankie* fields of Rhodesia and at *Newcastle* and *Dundee* along the coastal plain of Natal. *Iron* is mined in Algeria and rich deposits in other parts are awaiting development. The tin mines of the *Bauchi* plateau in Northern Nigeria are becoming very important.

COMMUNICATIONS (Fig. 29)

The routes are of two kinds: (1) *land-routes* and (2) *water routes.* Under land communication come roads, railways, and caravan routes; under water communication come seas, rivers, lakes and canals.

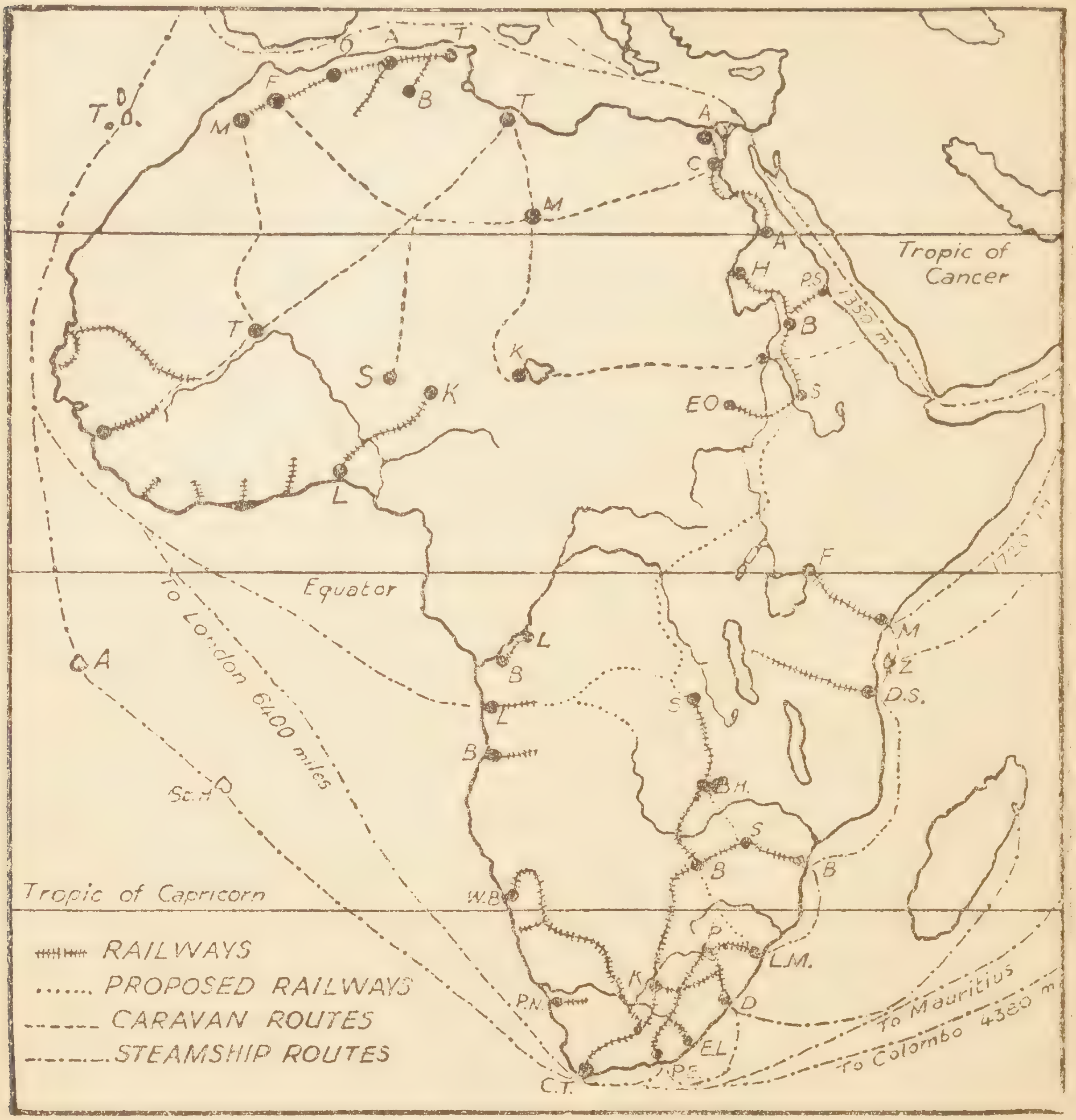


FIG. 23. Communications

The *methods of transporting goods* are closely related to the geographical conditions of the places where they are adopted. In most parts of forested West Africa and Equatorial Africa, *human carriers* are employed to take the rubber, palm-oil kernels, ivory and other products to markets or ports. In the desert journeys are possible only on account of the *camel*. In the Atlas Region, the *mule* is the chief beast of burden. Mules are preferred for all but riding purposes in South Africa. They are less subject to germ-diseases than horses or donkeys. On the tropical grasslands the *ox* is used for riding and for carrying bales of goods, as in parts of Nigeria and *Angola*. In South Africa also it is the draught animal, as the horse is more susceptible to diseases.

Caravan Routes across the Sahara : There are regular caravan routes in the Sahara, the oases being used as stations where provisions and water may be obtained. But the great terror of the caravan traveller is the *simoon* or desert sand-storm. Travel by caravan has greatly declined in recent years ; for much of the trade of the Sudan which formerly crossed the desert to Mediterranean Africa is now carried more quickly and cheaply by sea.

Roads : Nowadays it is possible to travel by motor cars from *Algiers* to *Timbuktu*, a distance of nearly 1,250 miles. 'Desert cars' with 'caterpillar wheels' are used, and these can be turned into sleeping-cars at night. Good roads suitable for cart or motor traffic have been constructed not only in Algeria by the French, but also in South, Central and East Africa and on the Gold Coast by the British. But much remains to be done in this respect.

Railways : To construct a coach-road in Africa is nearly as expensive as a railway. Therefore Africa usually has its railways built before its roads. Most of the modern development of Africa is due to the introduction of railways. These will be found in areas under European domination. As in Australia many of the lines run inland for a short distance from the ports ; *e.g.*,

(1) From *Mombasa* in Kenya to Lake Victoria and Uganda ;

(2) From *Dar-es-salaam* to *Ujiji* on Lake Tanganyika *via Tabora* ;

(3) From *Beira* to *Salisbury* and *Bulawayo*;
(4) From *Durban* to *Johannesburg* ;
(5) From *Port Nolloth* to *Ookiep* ;
(6) From *Benguela* to *Katanga* ;
(7) From *Lagos* to *Kano* in Nigeria.

In the Atlas Region the railway line runs along the coast with branch lines across the mountains to the desert margin. It is only in the Nile Region that the railway line follows the river valley.

Probably, Africa's first trans-continental railway will be the *Cape to Cairo Railway.* This will run north to south unlike the other trans-continental railways of the world which run east and west as in Canada, U.S.A., and Siberia. In what direction does the Australian trans-continental railway run ? The Central and most difficult section of the Cape to Cairo line has not yet been constructed. The northern section from *Cairo* to *Khartoum* and thence to *Sennar* is complete except for the portion between *Aswan* and *Wadi Halfa*. From *Cape Town* in the south-west corner the line has reached *Broken Hill* in North Rhodesia, and thence it has been taken *via Katanga* to *Bukama* on the Lualaba in Belgian Congo.

The route by which tourists can at present cross the continent from Cape to Cairo is as follows ;

Cape Town to *Bukama* by *railway* ;

Bukama to *Stanley Ville* and *Buta* along the upper Congo by *alternative rail and river steamer* ;

From *Buta* by *motor road* to *Rejaf* on the upper Nile;

Rejaf to *Khartoum* by *river steamer* ;

Khartoum to Wadi Halfa by *rail* ;

From *Halfa* to near *Aswan* by *steamer* ;

And from *Aswan* to *Cairo* by *rail.*

Altogether the journey will take 51 days.

The total distance from Cairo to Cape Town is about 5,600 miles.

But more important than the north and south through-line are the lines connecting it with the coast ; for these lines will bring the rich products of the interior to the ports.

Rivers : As regards water routes, the Nile, the Niger, the Congo and the Zambesi have been great highways. Steam boats ply on their waters, though *through* navigation is not possible on account of the falls and cataracts. In some cases these obstructions are overcome by the construction of railways as in the case of the Congo. How is this a disadvantage to the transport of goods ? Where the rivers are not suited to steam navigation, the native-made boats or canoes do much of the trade as in the upper Niger, the Zambesi, the Shire and the Shari. They are also used on the Lakes Victoria, Tanganyika and Nyasa in addition to the steamers that are plying there regularly.

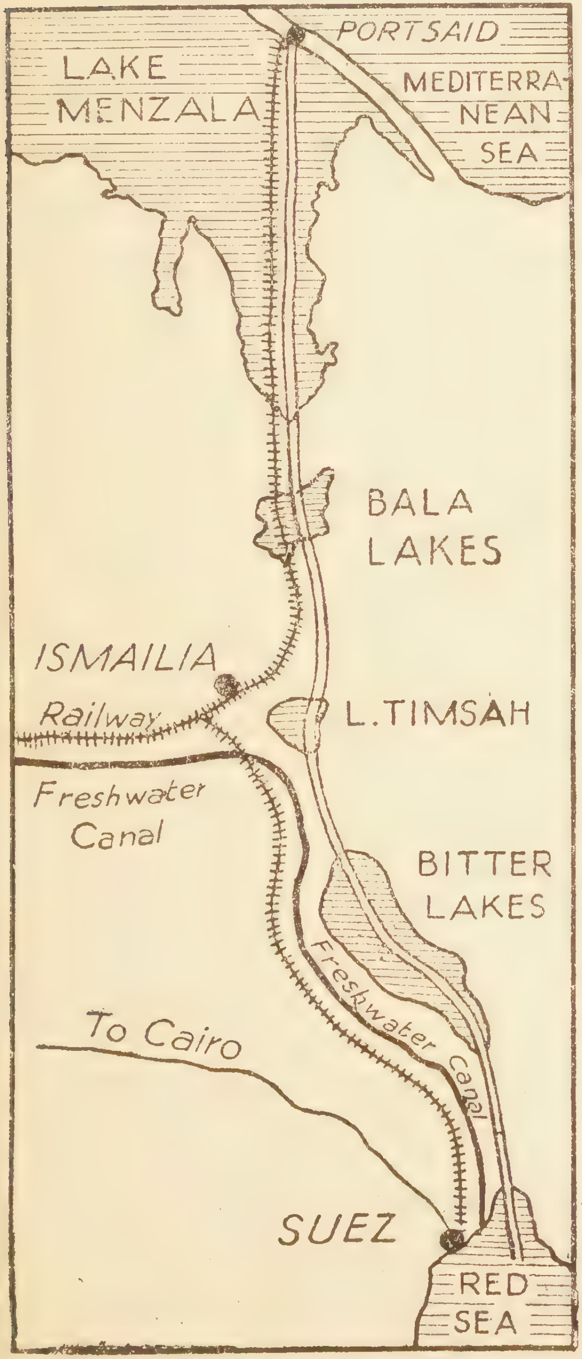


FIG. 30, The Suez Canal

Canals : On the whole, Africa is unsuitable for the construction of canals. Why ? The only canal of importance is the *Suez Canal* (Fig. 30). It is in Egyptian territory and forms the main highway between Britain and India, Australia and other far-eastern parts of the Empire. This canal was opened in 1869 and is nearly 100 miles long. The width of the bed is 121 feet and the depth is 31 feet. About three-fifths of the vessels using the canal are British. The canal lies between *Suez* and *Port Said*, connecting the Red Sea with the Mediterranean. A railway line also runs almost parallel to the canal and the canal zone is supplied with fresh water by a fresh-water canal from the Nile.

Ocean routes : The opening of the Suez Canal has greatly increased the trade between the countries of Western and Mediterranean Europe and those of Asia and Australia. But many vessels find it cheaper to take the *Cape Route*, as the charges levied on goods and passengers passing through the Suez Canal are high. As much of the trade of South Africa is with England, there is regular steamship service between *London* and *Cape Town*, the distance between the two being 6,000 miles. All the east coast ports are visited by coasting steamers. Find from your atlas the distances between the ports. *Algiers* has regular trade with *Marseilles*, the nearest French port, the distance between the two being 400 miles.

Air Route : Air service from London to Cape Town has been recently opened (1931-32) by the Imperial Airways, and the route from Cairo to Cape goes through Kenya and Tanganyika. The flight from London to Cape Town takes about 9 days.

Wireless : *Cairo*, *Kanga* (Congo Basin), and *Cape Town* are the main wireless stations for communication with Europe : Cairo-Oxford : Kanga-Brussels ; Cape Town-Bodmin (England). At each of these African stations and from *Johannesburg*, *Durban*, *Algiers* and *Tunis* broadcasting is done locally.

EXERCISES

(1) In what parts of Africa are the following people found: Berbers, Tuaregs, Fellahins, Somalis? To which race of people do they belong?

(2) Which is the "land of the blacks"? Mention some of the physical characteristics of the Negro.

(3) To what extent may the Sahara be described as the real southern boundary of Europe?

(4) Write short notes on 'Hansas', 'Hovas', and 'Swahili'.

(5) Account for the large numbers of Indians in Kenya and Natal.

(6) Draw a map of Africa showing British and French territories; shade all British territories red and French territories blue. Mark also the 'mandated' territories.

(7) Account for the very dense population of the Lower Nile valley.

(8) Why is Africa on the whole very thinly peopled?

(9) Which regions of Africa are suitable for white settlement? Give reasons for your answer.

(10) Mention a place connected with each of the following minerals: gold, copper, tin, diamond and coal.

(11) Why are 'human porters' employed to transport goods from the interior of the Congo forest to the coast? Where are mules used?

(12) What is the Cape to Cairo Railway? How far has it been completed?

(13) "The most important commercial water-way in Africa is not a river, but a canal." Expand this statement.

CHAPTER VI

TRADE OF AFRICA AND TRADE ROUTES OF THE INDIAN OCEAN

Commerce between countries is carried on largely by means of steamers. All oceans *are one* so that ships can go from one ocean to another : but they always go along definite lines which are called "ocean routes." At intervals there are "coaling" stations where ships may obtain coal and other things which they may require.

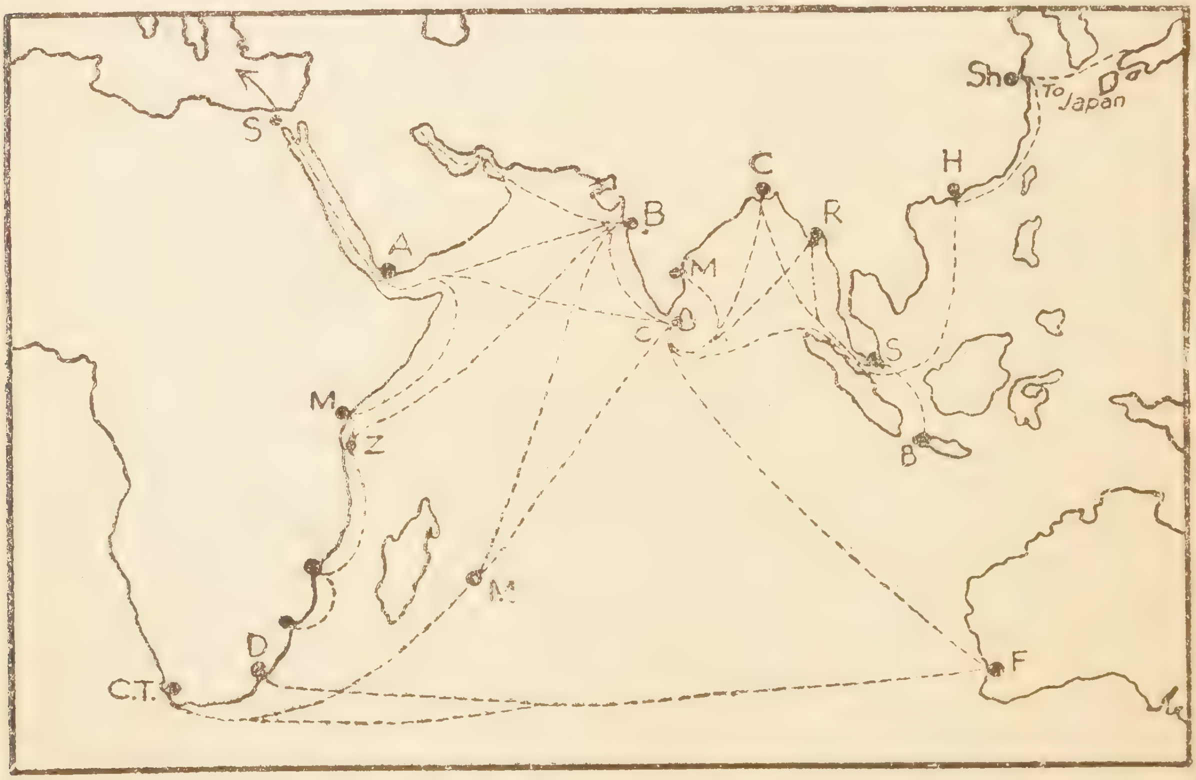


FIG 31. Trade routes of the Indian Ocean

Two of the principal trade routes of the world are found connected with Africa : (1) *the Suez Canal Route* and (2) *the Cape Route.* These two routes connect the Atlantic with the Indian Ocean. The Suez Canal route passes from the countries of Western Europe through the Mediterranean Sea, the Suez Canal and the Red Sea to the Indian Ocean. The Cape route goes southward over the Atlantic Ocean, and, after doubling the Cape of Good Hope, passes into the Indian Ocean.

The relative importance of these two routes has already been discussed. Ocean liners from Southampton (England) take about 18 days to reach *Cape Town*. From Cape Town one route goes direct to *Fremantle* in Australia and another to *Durban* (port of Natal) and thence to *Colombo* and *Bombay* via *Mauritius*. The voyage from Durban to Colombo takes 20 days. There is also a direct sea route between Australia and Durban.

The Arabian Sea with its arms—the Red Sea and the Persian Gulf—had been for ages the highway of commerce between the West and the East. This ancient route was for some time interrupted by the Turks when they conquered the lands of the eastern Mediterranean. Now the *Suez Canal* has restored the ancient route. It has increased the trade between the countries of Western and Mediterranean Europe and those of Asia and Australia. Nearly 5,000 steamers pass through the canal every year ; about three-fifths of these belong to the British. But big modern liners cannot pass through it. From Suez Canal the route runs down the Red Sea to *Aden* where it divides, one branch going north-eastwards to *Bombay* and *Karachi*, another eastwards to *Colombo*, and a third branch turning southwards to the ports on the east coast of Africa. There is also a direct route from *Aden* to *Fremantle* in Australia.

From *Colombo* the route divides into three branches. One goes to the ports of the Bay of Bengal—*Madras*, *Calcutta* and *Rangoon*. Another, the main route, goes to *Singapore*, *Hongkong* and *Yokohama*. The third route goes to Australia, the voyage to *Fremantle* taking 11 days.

The East African ports are visited by coasting steamers as shown in figure 31. Ships from Europe reach *Durban* by the Suez route.

The Suez Canal route is important in another respect ; it is the mail route between England and the East (India, the Far East, and Australia), the mail being carried by railway from *Calais* to *Marseilles* in France in order to avoid the circuitous sea route by the Strait of Gibralter. The 'Overland Mail' takes two weeks to Bombay and nearly a month to Australia. Now the 'Air-Mail' reaches *Karachi* from *London* in about a week.

There has been regular trade between the ports on the East Coast of Africa and *Bombay* and other Indian ports. *Bombay* trades directly with *Mombasa*, *Zanzibar* and *Dar-es-salaam.* The voyage from *Bombay* to *Zanzibar* takes 16 days. From *Mombasa* cotton is sent to Bombay, and from *Zanzibar* cloves. *Beira*, *Lourenco Marques* and *Durban* also trade with Bombay. Hence we find many Indian (Parsi, Hindu and Muhammadan) merchants in these ports. From *Mauritius* sugar is taken to *Bombay* which sends in exchange cotton goods and rice.

We have seen that the various regions of Africa are engaged only in *primary* production. The natives do not care to grow more than what is required for them. Where the climate enables the white man to work, the natural wealth of the country, whether plant, animal or mineral, is gradually being developed. So from all the areas under European control, either raw materials, food-stuffs or minerals are exported. From the British countries the chief exports are *wool* and *diamonds* (Union of South Africa), *gold* (Union of South Africa and Rhodesia), *cotton*

(Sudan), *cocoa* (Gold Coast) and *sugar* (Mauritius). To these the mother country sends manufactured goods, chiefly *textiles*. From the French countries the main exports are *palm products*, *fruits* and *rubber* (French West Africa), *wine* (Algeria), and *iron* and *phosphates* (Tunisia). Hence all ships leaving Africa to Europe carry mostly *raw materials* and *foodstuffs* and those coming to the African ports bring manufactured goods such as *textiles* and *machinery*.

The future development of the African states under European control depends upon two important conditions: (1) *the treatment accorded to the natives* and (2) *the attempt to suppress germ diseases.* Alcohol has been the cause of much of the native degeneracy and many of the native labour troubles. The conditions under which the natives live have to be improved and suitable methods of education should be introduced. The aim of the white men should be to so improve the natives as to make them fit for eventual freedom.

The development of Africa has just begun and it is believed that, in course of time, it may prove to be the richest continent in the world.

EXERCISES

(1) With the help of your atlas find out the distances of the various routes marked on the sketch map.

(2) How is the Suez Canal route important to India?

(3) Which colonies of Great Britain act as (a) homes for her surplus population, (b) sources of supply for the raw materials required for her industries?

(4) Draw a map of Africa and mark therein the important ports which you have studied. By the side of each port write down the most important articles of export.

PART III

SOUTH AMERICA

SOUTH AMERICA

CHAPTER I

POSITION, COAST, AREA, RELIEF AND RIVERS

The world is divided into two hemispheres—the Eastern and the Western. The eastern half of the globe is known as the Old World and the western half as the New World. Within the former are included the two southern continents which we have already studied, *viz.*, Africa and Australia, and the two northern continents of Europe and Asia. Within the latter we find North America and South America. These continents form the New world, because they became known to the Europeans only at the end of the fifteenth century through the voyages of *Columbus* and the discoveries of *Amerigo Vespucci* and other seamen. Amerigo Vespucci was an Italian, and he made four voyages of discovery to the mainland of South and Central America. The continent was first named *America* after Vespucci.

Position : South America extends from 12° N. Lat., to 56° S. Lat.; so that both the Equator and the Tropic of Capricorn cross it. The broadest portion of the continent is between the Equator and the Tropic of Capricorn, and so nearly two-thirds of the continent lie within the Torrid zone. South America extends much farther south than Africa or Australia. It is connected with North America by the narrow isthmus of Panama which has now been cut through by a canal. Like its sister continent it is broad in the north and tapers to the south. It is bounded on the west by the broad *Pacific*, on the east by the narrow *Atlantic*, and on the north by the land-locked *Caribbean sea*.

Coast : The coast-line of South America is relatively short compared with the great size of the continent, one mile of coast to about 430 square miles of area being the proportion. Find the proportion of coast-line to area in the case of the other southern continents. This short coast-line is due to the absence of peninsula and long arms of the sea penetrating far into the land.

The Pacific coast is remarkable for its narrow plains, for its lack of large inlets, and for its very narrow continental shelf. The narrow coastal plain varies in width from 40 to 100 miles, the greatest width occuring south of the *Gulf of Guayaquil*, the only large opening along the Pacific Coast. South of 42° S. Lat. the coastal plain dies out, and mountainous shore occurs. Here on account of the sinking of the land the ocean has invaded the former land valleys which had been broadened and deepened by the action of glaciers. Thus a *fiord** coast similar to that of Norway in Europe has been formed.

The highest parts of the coastal range stand out as islands. *Magellan Strait* which separates the island of *Tierra del Fuego* from the mainland is a fiord piercing right through the mountain range. The strait has been named after Ferdinand Magellan who forced his way through it in 1520.

The Atlantic coast has a broader continental shelf which attains a width of 400 miles off the coast of Patagonia. Many *continental islands* rise from the shelf, the more important of these being the *Falkland Islands* in the south and *Trinidad* in the north. The broad continental shelf is due to the subsidence of land along the coast. The Amazon mouth has receded 400 or 500 miles so that some of the rivers of North Brazil which once formed its tributaries now form independent streams. The 'estuary' of the *La Plata* and other gulfs along the coast of Argentina have been formed by subsidence of land. The Brazilian ports of *Santos* and *Rio-de-Janeiro* have a similiar origin. Near the coast of Eastern Brazil which is backed by the steep edge of the plateau, the continental shelf is narrower, and coral reefs fringe the shore. These reefs act as natural breakwaters for such ports as *Bahia* and *Pernambuco.*

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* A 'fiord' is a long narrow winding inlet of the sea with high cliffs on either side.

Size: The continent extends through 68 degrees of latitude, and through 46 degrees of longitude at its greatest breadth. Calculate the greatest length and breadth of the continent in miles. The area of the continent is about 7 million square miles and is more than twice that of Australia.

RELIEF

South America falls into three physical divisions: (1) *Mountains in the West*, (2) *Plains in the Centre*, and (3) *Highlands in the East.* (Fig. 1).

The Mountains: The western mountains are known as the *Andes* or the *Andean* '*Cordilleras*' which run north to south along the west coast from Panama to Cape Horn for a distance of about 5,000 miles. In the north the mountain system consists of *three ranges* which gather into a knot at *Pasto* near the Equator. The most easterly of these begins at Trinidad. The valleys between these three ranges are occupied by the *Magdalena* and its tributary. South of the knot the mountain divides into

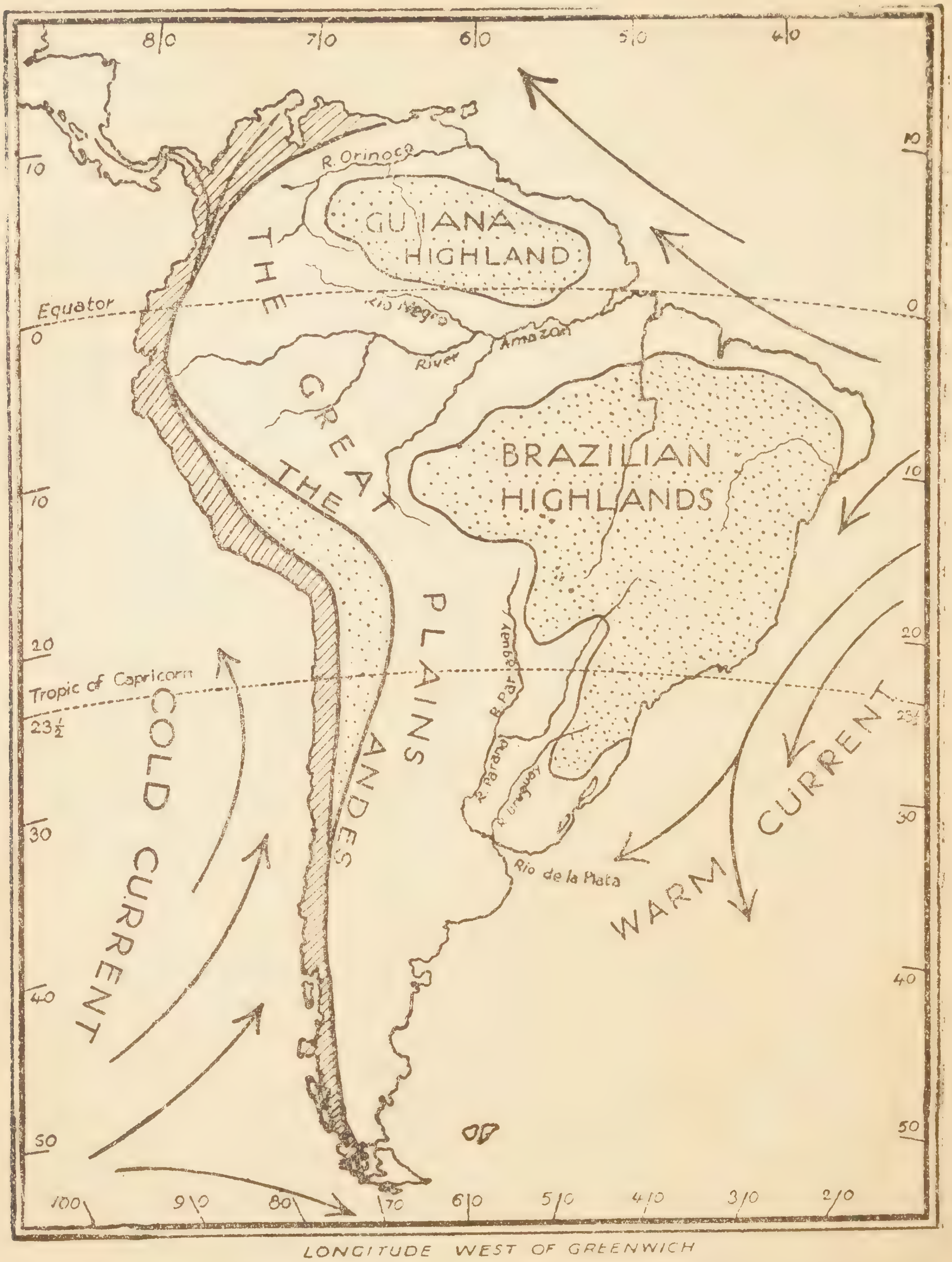

FIG. 1. SOUTH AMERICA: Relief

two ranges which enclose the plateaus of *Ecuador*, *Peru* and *Bolivia*. In Ecuador there are many volcanic peaks, the chief of which are *Cotopaxi* (19,000 ft., still active) and *Chimborazo* (20,000 ft.). The Bolivian plateau where the mountain system is at its widest is an area of inland drainage. It contains *Lake Titicaca* (130 miles long and 44 miles broad) which is overlooked by two peaks, one of which is *Sorata* (21,000 ft.). This plateau is 12,000 ft. above sea level and is next to Tibet in elevation. South of Bolivia the two ranges unite to form one mighty chain. This part of the mountain contains the highest peak *Aconcagua* (23,000 ft.) which overlooks the *Uspallata* pass (12,800 ft.). The *Trans-Andine* railway from *Buenos Aires* to *Valparaiso* passes through a tunnel under this pass. Very near the west coast, especially in Chile, a coastal range rises steeply from the ocean 5,000 ft. high. It is submerged in the south and forms the islands of South Chile. Between the coastal range and the main chain there runs a narrow longitudinal valley.

The Plains: The great plain in the centre consists of four regions: (1) the *Orinoco Basin*, (2) the *Amazon Basin*, (3) the *Parana-Paraguay Basin* and (4) the *Shingle Desert of Patagonia*. The last is upwards of 600 feet in height and is cut through by rivers draining the eastern slopes of the Andes. The three river basins form flat plains built of the rich sediment brought down by the rivers. The Amazon and Plate Basins were once occupied by the sea. The water parting between the river basins is so very low that all the three river basins may be said to form one single fluvial basin, for the waters of one basin are sometimes deflected into those of the neighbouring river system.

The Highlands: The Eastern higlands are cut into two plateaus by the Amazon. The northern plateau is the *Guiana Highlands*, and the southern, the *Brazilian Highlands*. These highlands are made up of ancient rocks and formed part of a continent which once extended right across the southern hemisphere. Portions of Africa, the Deccan plateau and Western Australia also formed part of this continent. The Brazilian plateau whose average height is 3,000 feet has a coastal ridge in the south-east and slopes gradually towards the north. The highest part of this ridge is 8,000 to 10,000 feet in elevation. Compare the Drakensberg in South Africa. The northern slopes of the plateau are dissected by the tributaries of the Amazon. The mountains and plateaus are rich in minerals. The highest point of the Guiana Highlands is about 7,500 feet above sea level.

RIVERS

Since the mountains lie close to the west coast, the rivers flowing into the Pacific are short and unimportant ; but those flowing east are long and useful.

The Orinoco (1,500 miles) rises on the southern slopes of the *Venezuelan Highlands* and, after curving round them, flows eastward into the Atlantic. It is navigable for about 1,000 miles. A tributary of the Upper- Orinoco (the *Cassiquire*) actually joins the *Rio Negro*, a tributary of of the Amazon along the Negro to the Orinoco. The river has a delta at its mouth.

The Amazon (3,500 miles long) rises in the Peruvian mountains and flows through a vast low-lying plain in a region of very heavy rainfall. So it is a large river with several tributaries. It enters the sea by a large estuary in which lies the island of *Morajo.* The *Para Channel* to the south of the island forms the entrance of the river. The whole river system has something like 25,000 miles of navigable waterway. Ocean steamers can reach *Iquitos*, about 2,000 miles up the main river. The Amazon of all rivers in the world has the largest basin and the greatest volume of water. Its fresh water can be distinguished even at a distance of 200 miles from the shore. The sediment brought by the river is carried away by tides and currents so that no delta is formed. Compare the *Congo*.

Rio de La Plata (the Plate Estuary) is the name given to the combined mouths of the *Parana* and *Uruguay* rivers. The Parana rises in the eastern portion of the Brazilian Highlands, while its tributary the *Paraguay* rises in the *Matto Grosso* (Great Woods) which separates this basin from that of the Amazon. These rivers flowing south-ward to one estuary form an important waterway into the interior. The Parana-Paraguay Basin is not forested like that of the Amazon, but consists of grass and agricultural lands and is therefore better fitted to be the home of man. The Paraguay is navigable as far as *Asuncion*, but the navigation of the Parana is limited by the water-falls which occur at the point where the river descends from the Brazilian highlands.

There are two other rivers of some importance. The *Magdalena* flows northwards through a long valley of the Andes into the Caribbean Sea. This river is the highway of commerce for the Republic of Columbia, and is navigable for river steamers of shallow draught. The *Sao Francisco* which is as long as the Indus (1,800 miles) flows through the Brazilian plateau first northward and then eastward into the Atlantic. This river has a cataract where it descends from the plateau, and therefore it is navigable for nearly 200 miles up from the sea for nearly 800 miles above the cataract.

(For Exercises on this Chapter see page 153).

CHAPTER II

CLIMATE

TEMPERATURE

The broadest portion of South America lies within the tropics where the sun's rays are vertical or nearly vertical throughout the year ; so the temperature is hot throughout the year, the average being more than 70° F. The range of temperature is very low. A major portion of the continent lies in the southern Hemisphere ; therefore January is its summer (Fig. 2) and July its winter (Fig. 3). Note that in January the hot area includes not only the whole of tropical South America but also a large portion of the temperate part of the continent. The southern half of the continent lies in the temperate region ; but there are no extremes of temperature as the land there is very narrow and has therefore the moderating influence of the sea.

In the highlands temperature is lowered by altitude. Quito, although almost on the equator, has only a mean monthly temperature of 54·6° F.

Effect of Ocean Currents on Temperature : On the east coast the *warm South Equatorial Current* meets the Brazil coast at *Cape St. Roque* and is divided into two branches (Fig. 1). One flows past the Amazon mouth into the Carribbean Sea und the other goes south as the *Brazil Current* as far as the Plate Estuary. The *cold Antarctic Current* meets the coast of Chile in about 40° south latitude and spreads to north and south. The north-flowing branch is the *Humboldt Current* which is blown as far as the equator by the south-east trader. Hence the west-coast is colder than the east, and it is this that

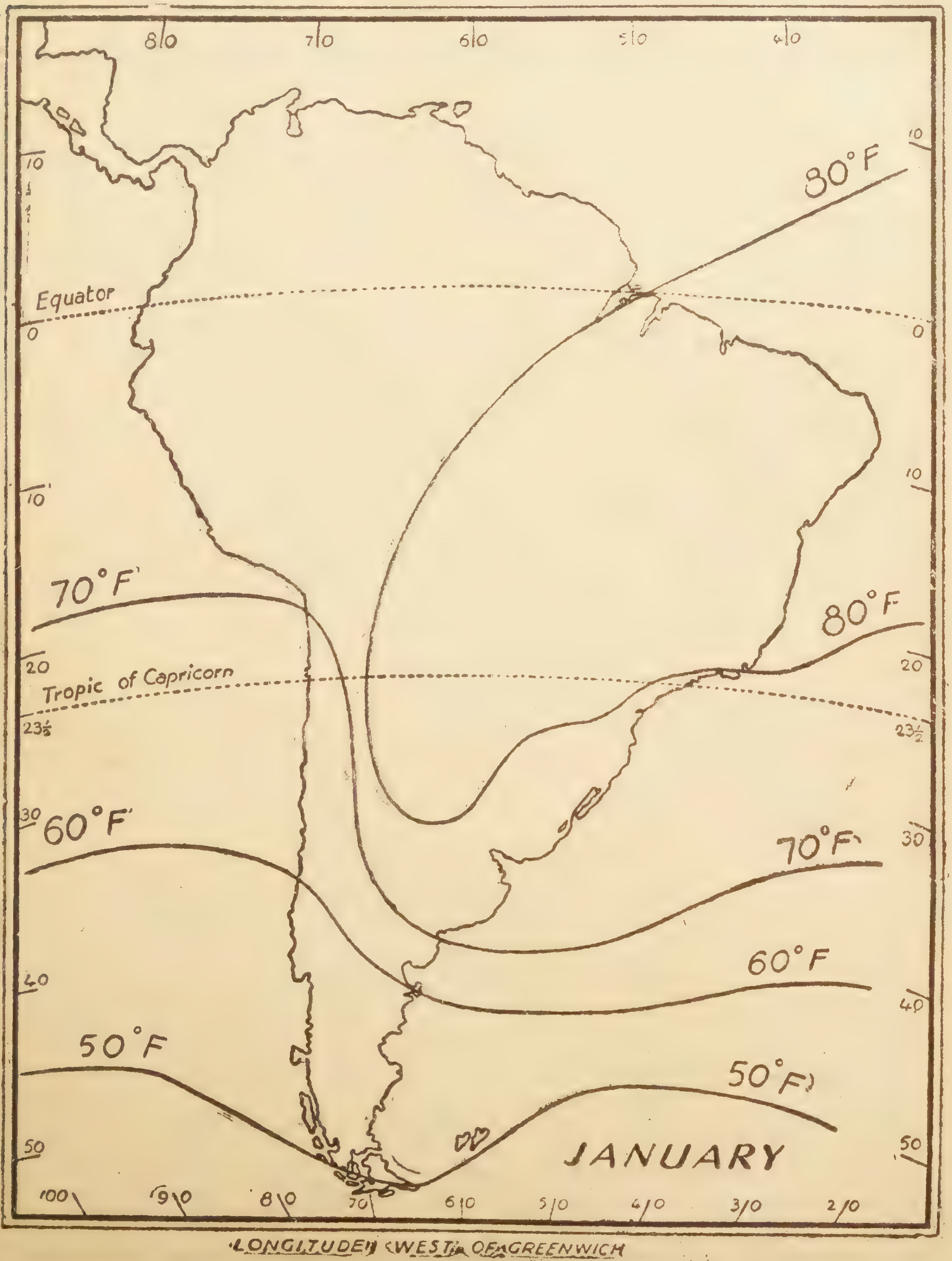

FIG. 2. Temperature: January isotherms

accounts for the pronounced northward bend of the isotherms over the Pacific coast throughout the year.

Note the summer (January) isotherms are more irregular than the winter (July) ones. Compare the 70° F.

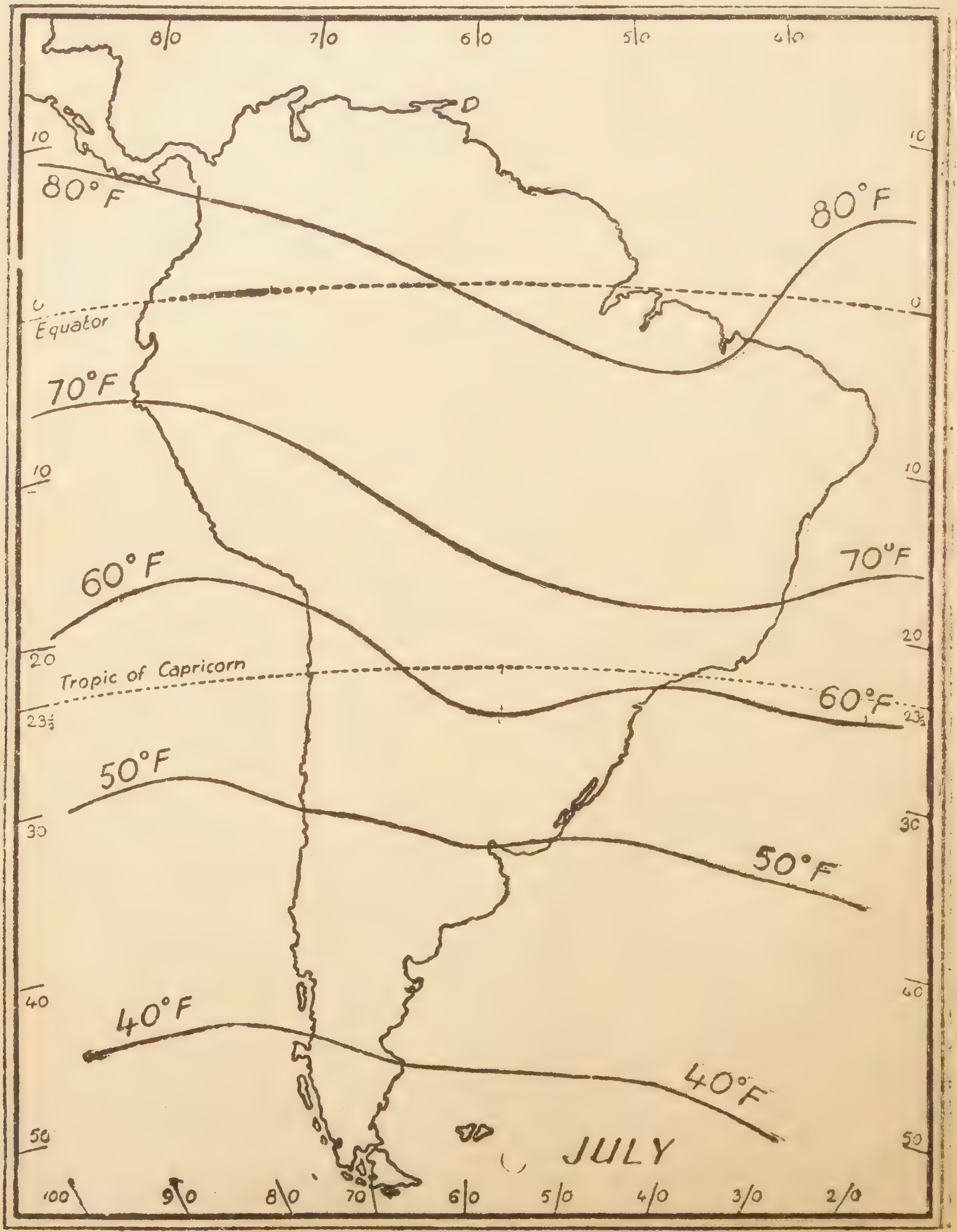

FIG. 3. Temperature: July isotherms

lines of January (Fig. 2) and July (Fig. 3). The January (summer) isotherm (70° F.) bends sharply southward from the west coast for nearly 20° of latitude. This is because the temperature of places to the east of the Andes in the

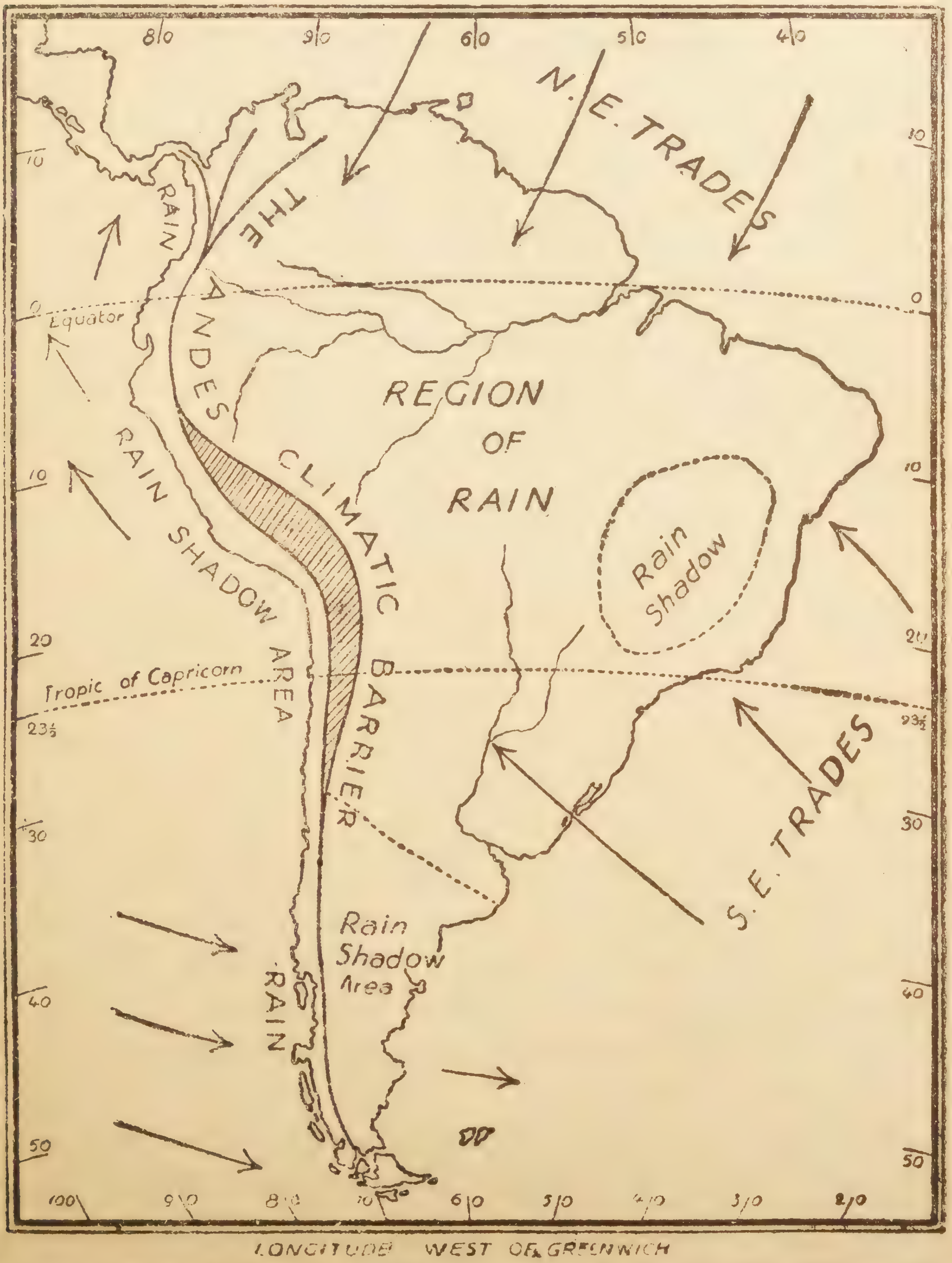

FIG. 4. South America: Mountain ranges acting as climatic barriers.

south is increased not only by the warm drifts but also by the *long summer days*. Note that the extension of the 80° F. line southwards beyond *Buenos Aires*, as shown on the January map is also due to the same cause.

WINDS AND RAINFALL

The migration of the equatorial low-pressure belt with the sun is similar to what we have learnt in connection with Africa. Hence the rain belts follow the same order in S. America as they do in Africa. In connection with South America you should remember the *two trade winds* of the tropical regions and the strong *westerlies* which blow towards the shores of South Chile. There is one great difference between Africa and South America as regards winds and rain. In South America, both the easterlies (trade winds) are moisture-laden winds and pass over the greater part of its surface ; but in Africa the north-east trade winds are land winds, and the south-east trades pass over only a small portion of the continent.

In Australia the Highlands which obstruct the easterlies lie close behind the east coast, while in South America the mountains which form a barrier to the easterlies lie close to the west coast. Therefore, in the case of the former, rainfall is confined to the east coastal plain, while in the case of the latter, rain is distributed over nearly the whole of the Atlantic slope. So the desert of South America is much smaller than that of Australia.

The effect of mountain ranges on distribution of rain is illustrated by figure 4.

Summer Conditions (November-April): Figure 5 represents southern summer and northern winter conditions. There is an area of relatively low pressure over central Brazil. The south-east trades sweep across the

Brazilian plateau in the Amazon lowland beyond. But these winds are obstructed by the higher edge of the plateau along the coast, and therefore there is heavy rain

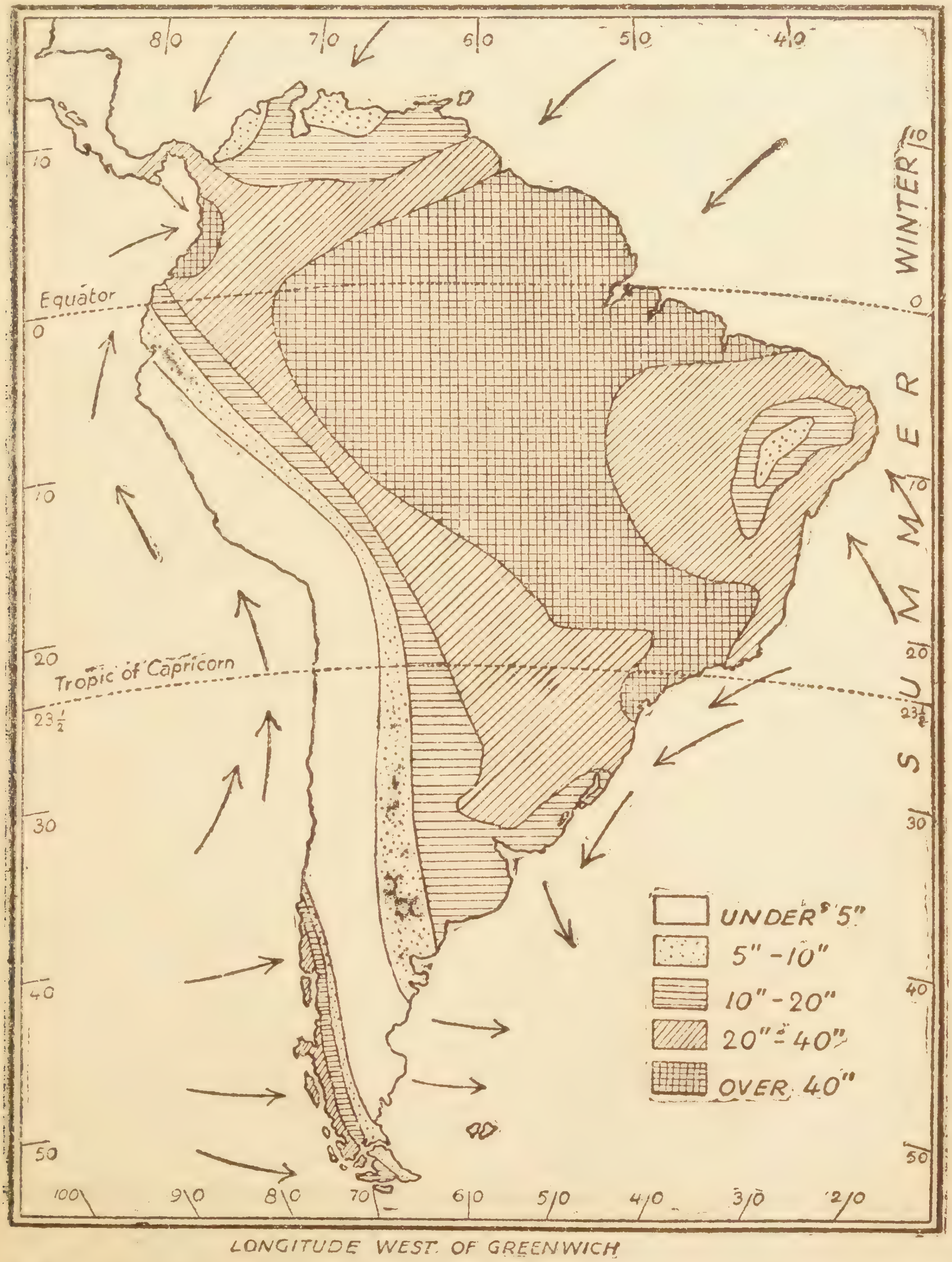

FIG. 5. Winds and Rainfall: Southern Summer Conditions (November to April)

especially in the hilly country west and south of *Rio de Janeiro.* Still the trade winds hold large quantities of moisture and give heavy rain to the eastern portion of the

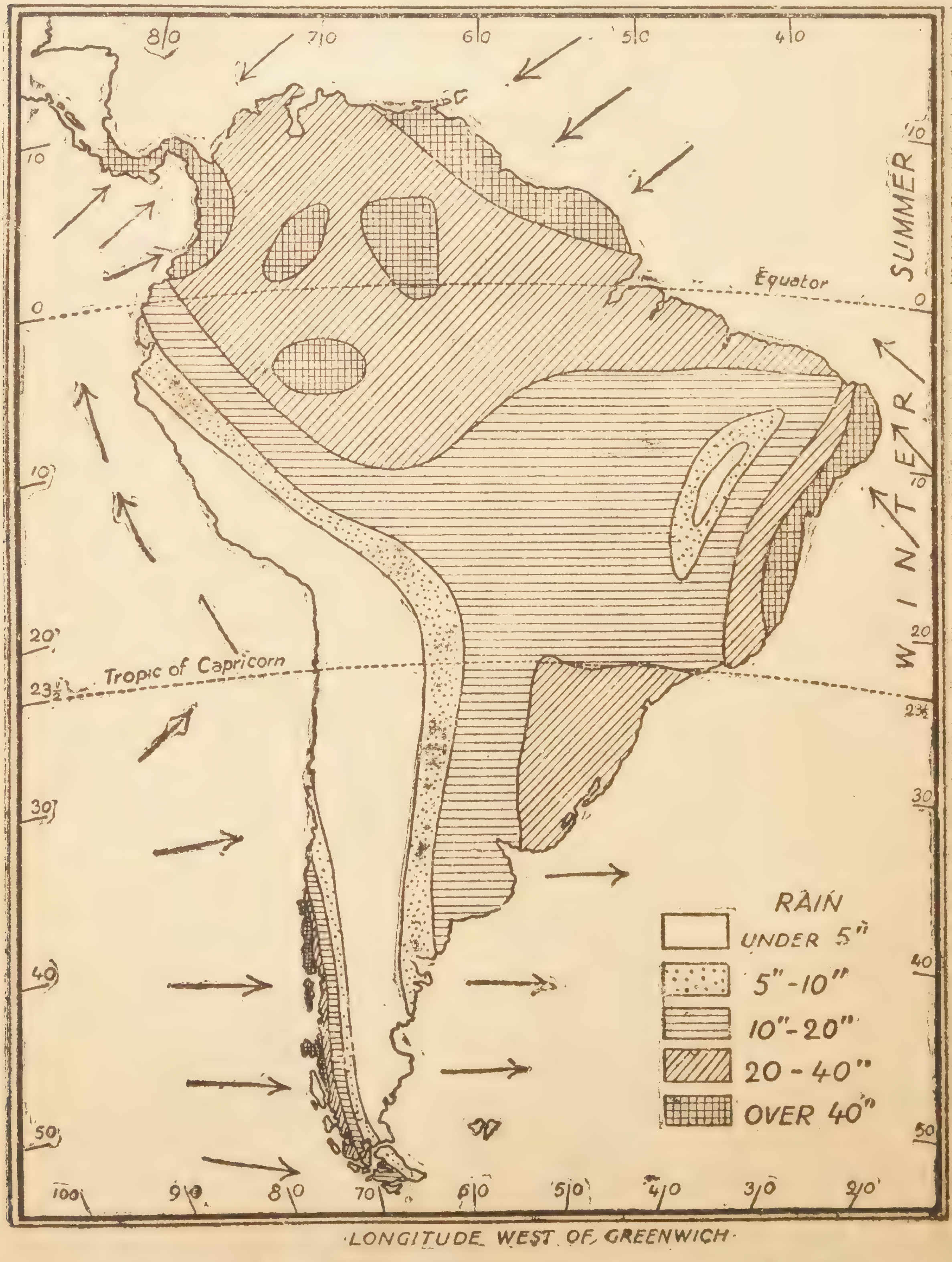

FIG. 6. Winds and Rainfall: Southern Winter Conditions (May to October)

great lowland. But the extreme east of Brazil is comparatively dry. The north-east trades cross the highlands of Venezuela, lose a little of their moisture, but carry the greater part forward to the Andes where they are forced upwards and yield very heavy rain.

South Chile gets its rain from the Brave Westerlies.

The Gulf of Panama region gets monsoon rains, for the south-east trades of the Pacific coast, after crossing the equator, form the south-west winds and give rain to the western shores of Colombia.

The coast of Peru and North Chile (Atacama) and Patagonia are deserts as they lie in the rainshadow (Fig. 4).

Winter Conditions (May-October) :—Figure 6 represents southern winter and northern summer conditions. The low pressure area lies over the north of the continent. The Guiana coast and highlands receive heavier rain than the Brazilian region. The Amazon lowlands do not receive such heavy rains as they do in southern summer. The extreme east of Brazil including the valley of Sao Francisco gets more rains from the south-east trades. North Argentina becomes drier, and the monsoon area of Panama has greater rain.

The westerlies blow farther north than in summer and give rain to Middle Chile. The coasts of Peru, Atacama and Patagonia are deserts as before. The Peru-Bolivian plateau is also dry.

The enclosed Sao Francisco Valley lying in the rain shadow is semi-arid. By far the greater part of the continent as far south as latitude 35° S. receives its rain in the southern summer.

THE CHIEF CLIMATIC REGIONS (Fig. 7)

(1) The Amazon Basin or 'Constant Rain' Belt :—This region has very heavy rains throughout the year. When the sun crosses the equator, the belt of calms lies over the basin. So the heaviest rain falls near the equator about the time of each passage of the sun.

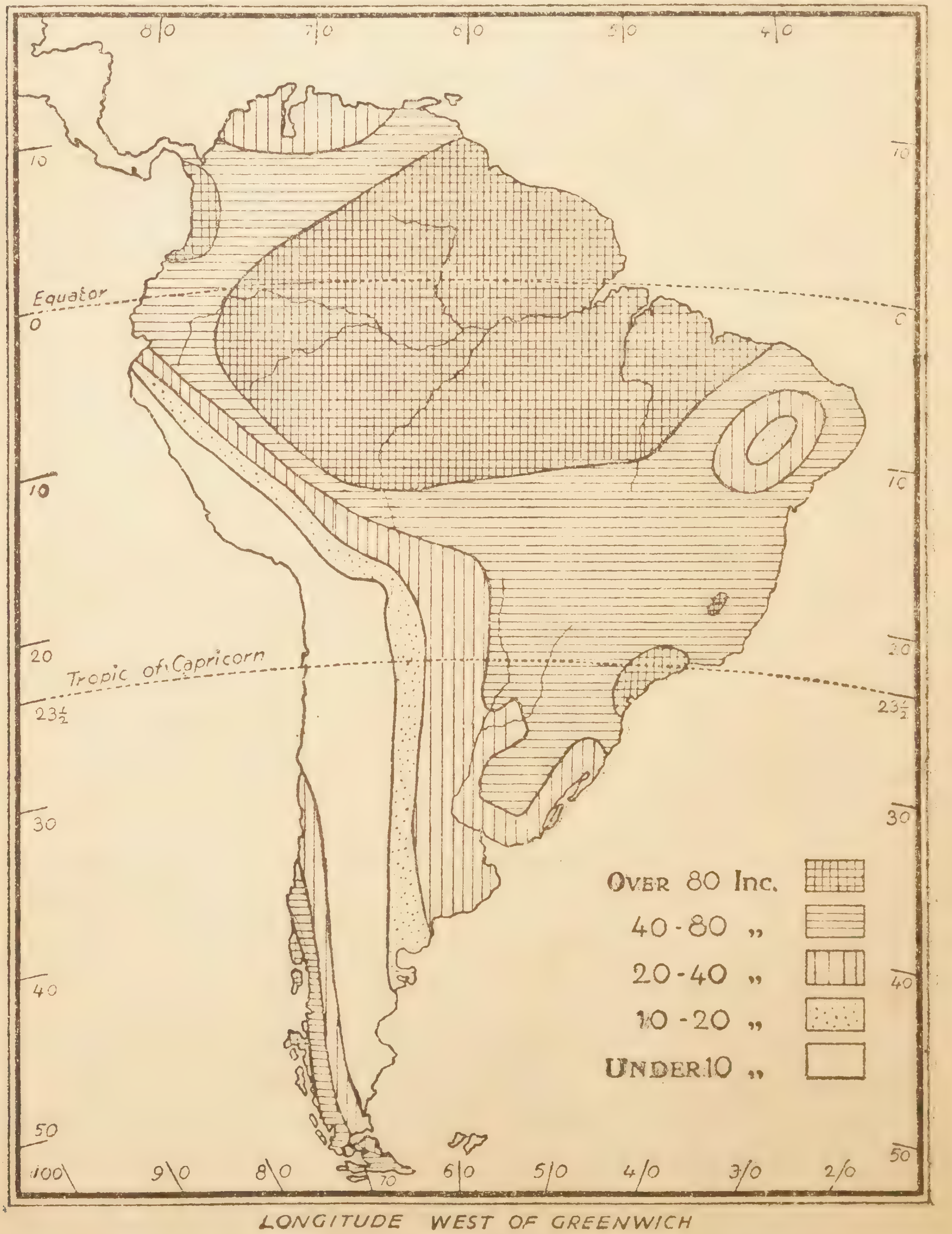

Fig. 7. South America : Mean Annual Rainfall

Again this region lies in the path of the trade winds which are sea-winds blowing over warm currents and are therefore laden with moisture. These winds gradually move inwards and upwards and are obstructed by the semi-circular curve of the Andes. Hence rainfall is heavier near the Andes than further east: *Iquitos*, 103″; *Manaos*, 83·7″. The temperature of this region is generally high with little difference between the seasons: *e.g.*, *Para*, coolest month, 77° F.; hottest month, 79·7° F. Compare the Congo Basin. Note the double rainfall maximum of this belt, *e.g.*, Manaos.

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Manaos	9·8	9·6	11·8	13·0	7·5	5·1	3·0	1·8	1·5	3·9	6·4	10·3	83·7

(2) **The 'Summar Rain' Belts North and South of the Amazon Basin**:—These are regions of summer rainfall and winter drought. The northern belt, which includes the north coast of Colombia and the coasts of Venezuela and the Guianas, has its rain in northern summer,; *cf.*, Sudan. Here the temperature is hot throughout the year and the range of temperature is low: *e.g.*, *Georgetown*: coolest month (Feb.), 78·4° F.; hottest month (Oct.), 81·1° F.; range of temperature, 2·7° F.

The southern belt which includes parts of Brazil and the Parana-Paraguay basin has its rain in southern summer; *cf.* the Zambesi basin. Here the range of temperature is greater than in the northern belt and it increases as we go southward: *e.g.*, *Rio de Janeiro*, coolest month (July), 67·5° F.; hottest month (Feb.), 78·1° F.; range. 10·6° F. *Buenos Aires*, coolest month (July), 50·2° F.; hottest month (Jan.), 73·6° F.; range, 23·4° F. Compare the rainfull (in inches) of the following places:—

	J	F	M	A	M	J	J	A	S	O	N	D.
Caracas	0·9	0·3	0·6	1.2	2·8	4·0	4·8	3·8	4·2	4·4	3·3	1·6
Rio de Janeiro	5·0	4·3	5·3	4·4	3·5	2·0	1·6	1·8	2·6	3·2	4·3	5·4

(3) **The Coastlands of Peru and North Chile or 'No Rain' Belt** (Between latitude 5° S. and 30° S.):—Here the mountains form a complete barrier to the rain-bearing easterlies (Fig. 4). The south-east trade winds of the Pacific Ocean are off-shore winds or blow parallel to the coast. Hence this region is dry all the year. The coast of North Chile is called the *Atacama Desert*: *cf.* the Kalahari. Temperature is remarkably low and uniform on this coast owing to the influence of the cold current.

	J	F	M	A	M	J	J	A	S	O	N	D	Year.
Lima	0·03	0	0	0·03	0·03	0·2	0·3	0·5	0·5	0·1	0·03	0·03	1·8
Iquique	0	0	0	0	0	0	0·02	0	0·03	0	0	0	0 05

(4) **Central Chile or 'Winter-rain' Belt:**—The westerlies extend farther north in winter than in summer, and Central Chile between 30° and 37° S. Lat. comes under their influence. Hence this region has a 'mediterranean' climate, with winter rains and summer drought.

	J	F	M	A	M	J	J	A	S	O	N	D	Year.
Valparaiso	0	0	0 9	0·1	2·7	6·0	5 3	3·4	0·4	0·5	0·4	0	19 6

Compare this with Cape Town.

(5) **South Chile or 'All-Year Rain' Belt:**—South of 40° S. lat. on the west coast, the prevailing winds are the Brave Westerlies which give very heavy rain to the coast of South Chile and cause the rain shadow of Patagonia (Fig. 4). Temperature is generally cool and rain falls throughout the year. There is no region corresponding to this in Africa. Why? The western half of Tasmania resembles this region. Compare the rainfall of the following two places:

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Valdivia (West coast	2·9	3·2	6·4	9 3	15·3	17·5	15·4	13·5	7·3	5·0	4·4	4·8	105
Santa Cruz (east coast)	0·5	0·3	0·2	0·6	0·7	0·4	1·1	0·4	0·2	0·4	0·4	1·0	6·2

(6) **The Pacific Coast North of the Equator:** This narrow strip has rain all the year, but most rain falls in summer. The climate is of the monsoon type, as that of the Guinea coast of Africa.

(7) **The East Coast between the Tropic of Capricorn and the Plate Estuary:**—This region has warm moist east winds all the year. Therefore rainfall is evenly distributed throughout the year.

	J	F	M	A	M	J	J	A	S	O	N	D	Year.
Buenos Aires	3·0	2·5	4·6	3·0	2·8	2·7	2·2	2·4	3·0	3·6	2·8	3·9	36·5

EXERCISES—*Chapter I*

(1) Why are the two Americas called the 'New World'?

(2) (a) Which meridian nearly bisects the greatest length of the continent? Which islands lie on this meridian?

(b) Along what parallel of latitude does the widest part of the continent lie?

(3) Write in a tabular column (i) the area of each of the southern continents, (ii) the actual length of their coast-lines and (iii) the proportion of length of coast-line to area. (Refer to your atlas.)

(4) What is a 'fiord'? How is it formed? Which part of the coast of S. America has fiords? Name a fiord which penetrates right across the continent.

(5) 'South America consists of three highlands and three lowlands.' Name them.

(6) Draw a diagrammatic section of the continent along the Tropic of Capricorn and point out the chief structural features.

(7) What are the river basins of S. America said to form one single and almost unbroken plain?

(8) Why are the Pacific rivers of S. America small and unimportant?

(9) Given that Iquitos is 300 feet above sea level, calculate the average fall of the Amazon per mile from Iquitos to the mouth.

EXERCISES—*Chapter II*

(1) Construct a diagram to show the mean monthly temperatures (°F.) of Quito and Para. What is the latitude of each place? What do you learn as regards the range of temperature? Account for the difference in the monthly temperatures of the two places.

	J	F	M	A	M	J	J	A	S	O	N	D
Para	77·7	77·0	77·5	77·7	78·4	78·3	78·1	78·3	78·6	79·0	79·7	79·0
Quito	54·5	55·0	54·5	54·5	54·7	55·0	54·9	54·9	55·0	54·7	54·3	54·7

(2) Draw curves to show the temperatures of Buenos Aires and Georgetown (British Guiana). Do you find any difference?

	J	F	M	A	M	J	J	A	S	O	N	D
Buenos Aires	73·6	73.0	69·6	61·9	55·9	51·1	50·2	52·3	57·1	61·0	67·3	71·4
Georgetown	78·4	78·4	79·0	79·5	79·3	78·8	79·0	79·7	81·0	81·1	80·4	79·0

(3) Construct diagrams to show the rainfall of (i) Manaos, (ii) Rio de Janeiro, (iii) Iquique, (iv) Valparaiso, (v) Valdivia. State the region in which each is located.

(4) Account for the sharp S-like bend of the 70° January isotherm.

(5) What is the difference between an off-shore wind and an on-shore wind? Illustrate.

(6) What is the general effect of the trade winds on the climate of South America? Does this continent differ from the two other southern continents in this respect? Why?

(7) How does the rainfall of Southern Chile differ from that of Central Chile?

(8) With the help of the given data identify the places marked A, B, C and D, or state in what region each is. Give reasons for your answer.

Places	Height in feet	Coolest month	Hottest month	Mean Annual Rainfall	Remark about season of rainfall.
A	9350	54·3° F. (Nov.)	55° F. (Feb. & Sept.)	42·3 in.	Most rain in Apr. & Nov.
B	522	60·6° F. (Aug.)	73·4° F. (Feb.)	1·8 in.	Little rain all the year.
C	1703	46·9° F. (July)	67·7° F. (Jan.)	14·4 in.	Winter rain.
D	141	46·0° F. (July)	59·5° F. (Jan.)	105 in	Rain all the year.

CHAPTER III

VEGETATION, NATURAL REGIONS, ANIMALS

VEGETATION

Compare the natural Vegetotion map of South America, (Fig. 8) with the Mean Annual Rainfall map (Fig. 7). You see the close correspondence between rainfall and vegetation.

(1) **Equatorial Forests** :—The Amazon Basin, where the temperature is high and rainfall is heavy and constant, is covered with *Tropical Forests* known as the *Selvas*. These forests extend into the river valleys of the Brazilian Plateau and along the coastal plains of tropical America. The chief trees are *rubber* and *cinchona*, (*Cf*. the Congo Basin.) The forests on the eastern slope of the Andes are known as the *Montana*. On the Pacific slope in the north where the climate is hot and wet, there is also tropical forest.

(2) **Savannah or Tropical Grass-land** :—The regions of summer rain form the *Savannah* or Tropical Grassland. The grasslands of the Orinoco basin are known as the *Llanos* and those of Brazil, as the *Campos*, (*Cf*. the African Savannah.)

(3) **Sub-Tropical or Warm Temperate Forests**:—Along the middle courses of the Paraguay and the Parana there are *Sub-tropical Forests*, the most important tree being the *yerba mate* or Paraguay tea.

(4) **Temperate Grasslands** :—Further south where rainfall decreases, there are *Temperate Grasslands*

known as the *Pampas*. Compare these with the *Veld* of South Africa and the grasslands of the Murray-Darling basin.

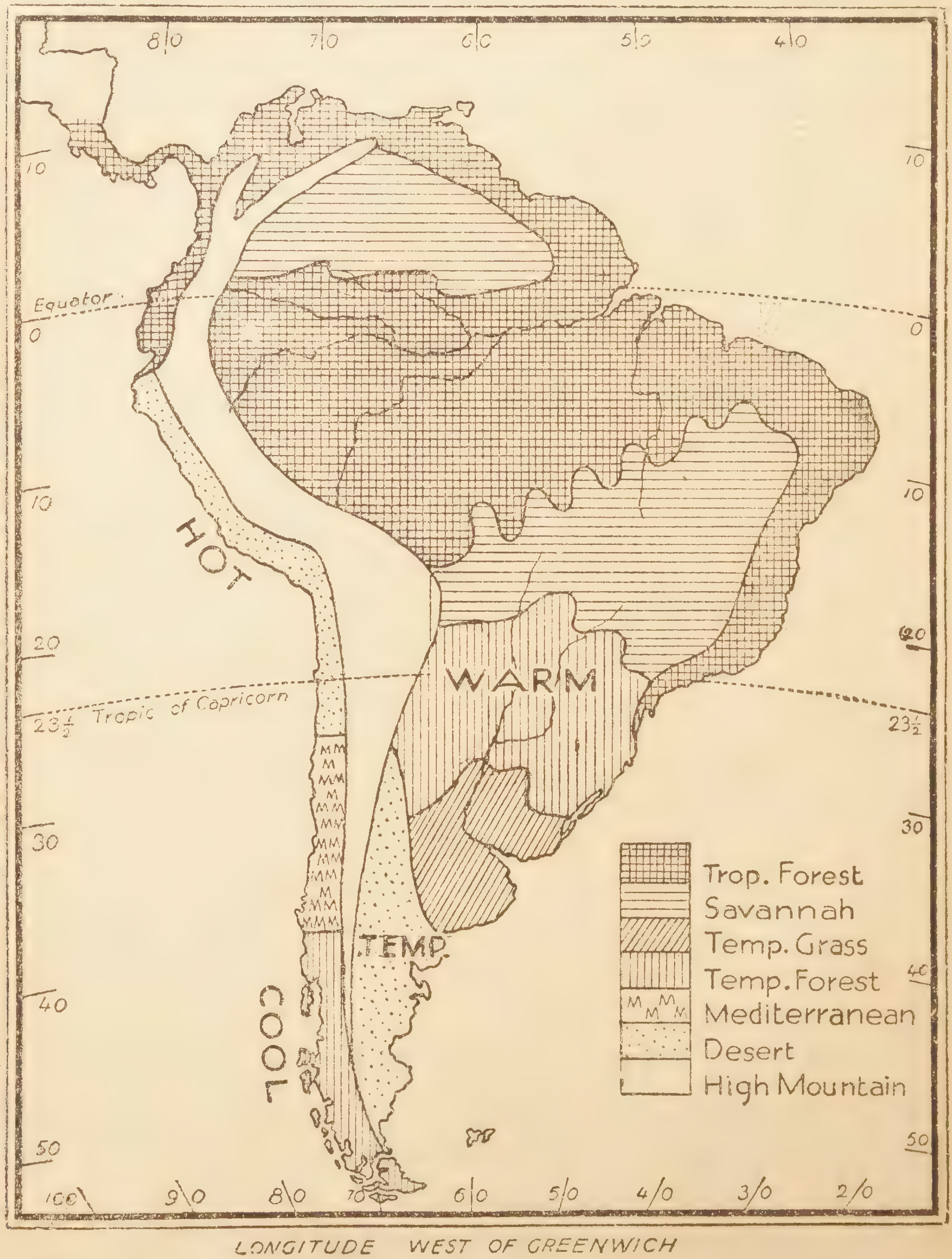

FIG. 8. South America: Natural Vegetation.

(5) **Semi-desert or Scrub-land:**—Patagonia in the rainshadow is a *semi-desert* or *scrub-land* with poor grass. (Marked Temperate Desert on map.)

(6) **Hot Desert:**—On the Pacific slope between 5° and 30° South Latitudes, where it is hot and dry, there is the Peru-Chilean (Atacama) *desert*; but along the courses of streams which cross the desert some vegetation is found. *(Cf.* the Sahara and the Nile.*)*

(7) **Mediterranean Type:**—In Central Chile which has rain in winter, the vegetation is of the 'Mediterranean' type, *i.e.*, trees and plants that have to adapt themselves to withstand the summer drought.

(8) **Cool Temperate Forests:**—In South Chile which is cool and wet are found *temperate forests,* with *deciduous* trees on the lower slopes and *coniferous* trees on the higher.

The Andean Zones. Temperature and Vegetation vary also according to altitude. In the Andes they vary from tropical to arctic conditions in the equatorial belt. Usually the Andes is divided into the following climatic and vegetation zones: (1) *Tierra caliente* or hot region from sea level to 3,000 ft. with a mean temperature from 83° to 75° F. Tropical vegetation is found here—*e.g.*, palms, bananas, rubber, cocoa and sugar. (2) *Tierra templada* or temperate region from 3,000 to 6,500 ft., mean temperature ranging from 75° to 65° F. The climate here is suitable for coffee, maize and sub-tropical fruits. (3) *Tierra fria* or cool region from 6,500 to 10,000 ft., mean temperature being from 65° to 54° F. Wheat and temperate fruits flourish here. *Quito* (9,350 ft.), capital of Ecudor, and *Bogota* (8,730 ft.), capital of *Colombia*, are in this region. (4) *Paramos*, from 10,000 to 13,000 ft., mean temperature ranging from 54° to 43° F. This is bleak and almost uninhabited with only stunted trees near the lower limits. *La Paz* (12,110 ft.) capital of Bolivia, is in this region. (5) Above 13,000 ft. there is perpetual snow.

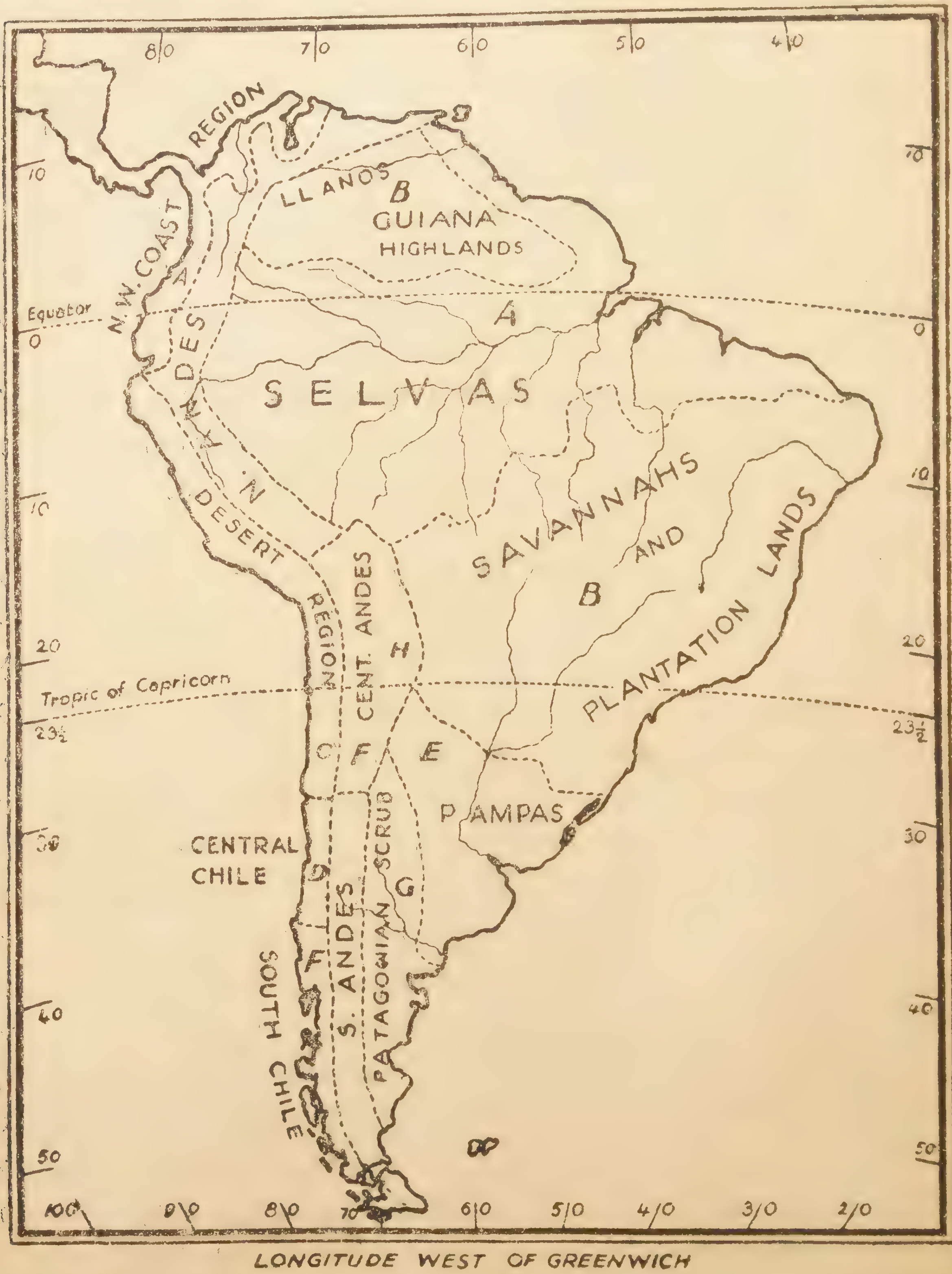

FIG. 9. South America: Natural Regions.

NATURAL REGIONS

Study the map showing natural regions (Fig. 9). You have already learnt that each natural region has its own climate, vegetation and, consequently, its own occupation. So the natural regions correspond with the climatic and vegetation zones.

The chief regions of South America are:—

No.	Region	Climate	Vegetation and Occupation
A	The Amazon Region or the Selvas.	Temperature high with little difference between seasons; rain all the year; annual mean rainfall being over 80 inches.	Dense equatorial forests. Collection of rubber and drugs, the chief occupation. Sugar-cane, cacoa, rice and bananas grown on the clearings. The tropical forests on the north-west coastal plains and on the coast of the Guianas have in many places been replaced by plantations.
B	Tropical Grass-lands N. & S. of the Amazon Region.	Summer rain and winter drought; wider range of temperature in the south than in th north.	Savannah type of vegetation; millions of cattle grazing on the *Llanos* of the Orinoco basin, the *Campos* of Brazil not so well developed. There are many plantations in the forest clearings in the coastlands of Brazil. Mining now an important occupation in the Highland.
C	The Peru-Chilean Arid Region	Dry all the year.	Desert. Northern portion crossed by several streams; belts of green along the streams called "little Egypts." Sugar and cotten grown by careful irrigation. In the southern part of the desert *i.e.*, in N. Chile rich deposits of *nitrates* are worked.

No.	Region	Climate	Vegetation and Occupation
D	Central Chile.	Mediterranean climate with warm dry summer and cool wet winter	Wheat barley and fruits cultivated in the Central Valley; in summer water is supplied by irrigation from rivers coming down from the Andes.
E	The Plate Region.	Even distribution of rainfall throughout the year and moderate range of temperature.	Upper basin forested; lower basin, *pampas.* Millions of cattle and sheep reared. Wheat and maize also grown.
F	South Chile and Tierra del Fuego.	Cool and wet; rain all the year; mean annual rainfall over 80 inches.	Cool temperate forests; lumbering not well developed. Sheep-breeding and fishing chief occupations. South cold and uninhabitable.
G	Patagonian Scrub Region.	Poor rainfall (less than 10 inches) with extremes of temperature, the range decreasing from north to south.	Poor grass. Sheep-rearing the only occupation, chiefly in the south. Land west of the Pampas cultivated by irrigation.
H	The Andean Region. (i) Northern zone	Heavy rainfall & low and equable temperature.	Cultivation on the slopes and mining chief occupations.
	(ii) Central Zone	Low rainfall; temperature lowered by elevation; daily range high.	Grasses; cattle, sheep, llamas, alpacas and goats reared; maize cultivated in irrigated areas; enormous mineral wealth.
	(iii) Southern Zone	Excessive rain or snowfall very cold.	Uninhabitable.

(1) **The Amazon Region:** There is rain all the year, the annual mean rainfall being over 80 inches. Temperature is high with little distinction between the seasons. The whole region is covered with dense forests which form 'a hopeless tangle of dense masses of trees of all sizes.' The chief occupation of the inhabitants is the collection of rubber and drugs. But the forest clearings are capable of producing all kinds of tropical products; *e.g.*, sugar-cane, cacao, rice, bananas.

The North-west coastal plains and the coast of the Guianas have also a high temperature and a heavy rainfall. Hence these areas also have dense tropical forests; but these forests have in many places been replaced by plantations.

(2) **The Tropical lands North and South of the Amazon Region:** The northern region includes the Orinoco basin and the Guiana Highlands where the temperature is high and rain falls in summer. The southern region includes the Brazilian Highlands which have also summer rains, but they have a wider range of temperature. Both the regions have droughts in their respective winters. Hence the vegetation is of the Savannah type. On the *Llanos* of the Orinoco basin to-day millions of cattle graze, and most of the people are cattlemen; but the *Campos* of Brazil are not so well developed. The coastlands of Brazil which receive heavier rainfall are forested, but there are now many plantations in the clearings. The interior of the forested Guiana Highlands is little known and few people live there. Mining is now an important occupation in both the Highlands.

(3) **The Peru-Chilean Arid Region:** Along the coast the temperature is uniform and low, and behind the

[illegible]
[illegible]
across the N. portion of the Peruvian region

coast range it is subject to extremes. The region is dry all the year ; but across the northern portion of the desert several streams flow from the Andes. By careful irrigation cotton and sugar can be grown ; hence the belts of green along the streams have been called "little Egypts." Sugar and cotton are grown here. The southern part of the desert in Chile has rich deposits of *nitrates*, which have given rise to a number of ports along the coast.

(4) **Central Chile :** This has a 'Mediterranean' climate with a warm summer and a cool wet winter. The most fertile part of this region is the Central Valley between the Andes and the coast range. Wheat, barley and fruits, chiefly vine, are grown. During summer water is supplied to the fields and vineyards by irrigation channels from the short rivers which come down from the Andes.

(5) **The Plate Region :** Here there is sufficient rainfall distributed evenly throughout the year. The seasonal range of temperature is moderate. The upper basin is forested and the lower basin forms the temperate grasslands known as the *Pampas* on which millions of cattle and sheep are now reared. Large quantities of wheat and maize are also grown. Over these grasslands once roamed herds of *deer*, *guanaco* and other wild animals.

(6) **South Chile and Tierra del Fuego :** The climate is cool and wet, the mean annual rainfall being over 80 inches. The extreme south is very cold and is therefore uninhabitable. The slopes of the mountains are covered with dense temperate forests ; *sheep-breeding* and *fishing* are the chief occupations. *Lumbering* is carried on to some extent.

[illegible]

(7) **Patagonian Scrub Region :** This includes also

that part of Argentina which lies behind the Pampas. This region lying on the leeside of the Andes has a poor rainfall (less than 10 in.) and greater extremes of temperature than elsewhere in the continent, the annual range decreasing from north to south. Hence it is poor grassland. *Sheep-rearing* is the only occupation, especially in the south where there is some rainfall, because the mountains are low there. The land wast of the *Pampas* can be cultivated with the help of irrigation.

(8) **The Andean Region :** This can be divided into three zones. (i) *The Northern zone* : Here the mountain chains enclose deep valleys occupied by rivers. Rainfall is heavy and temperature is low and equable. *Cultivation* on the mountain slopes and valleys and *mining* are the chief occupations.

(ii) *The Central Zone* : This is a shut-up area, and therefore the rainfall is very small except on the eastern slopes. Temperature is lowered by elevation and tends towards extremes, the daily range being very high. Only grass grows so that *cattle*, *sheep*, *llamas*, *alpacas* and *goats* are reared. In places where irrigation is possible *maize* is cultivated. The portions of the plateau capable of cultivation are called *punas*, higher and bleaker parts being called *paramos*. The mineral wealth of this region is enormous. [illegible]

(iii) *The Southern Zone* : Here there is excessive rainfall or snowfall. The low temperature renders the region almost entirely uninhabitable.

Varaiman on [illegible]

ANIMALS

The forests of the Amazon basin are full of animal life. Many varieties of monkeys live among the trees. Gaint snakes live by the rivers; the anaconda, the king

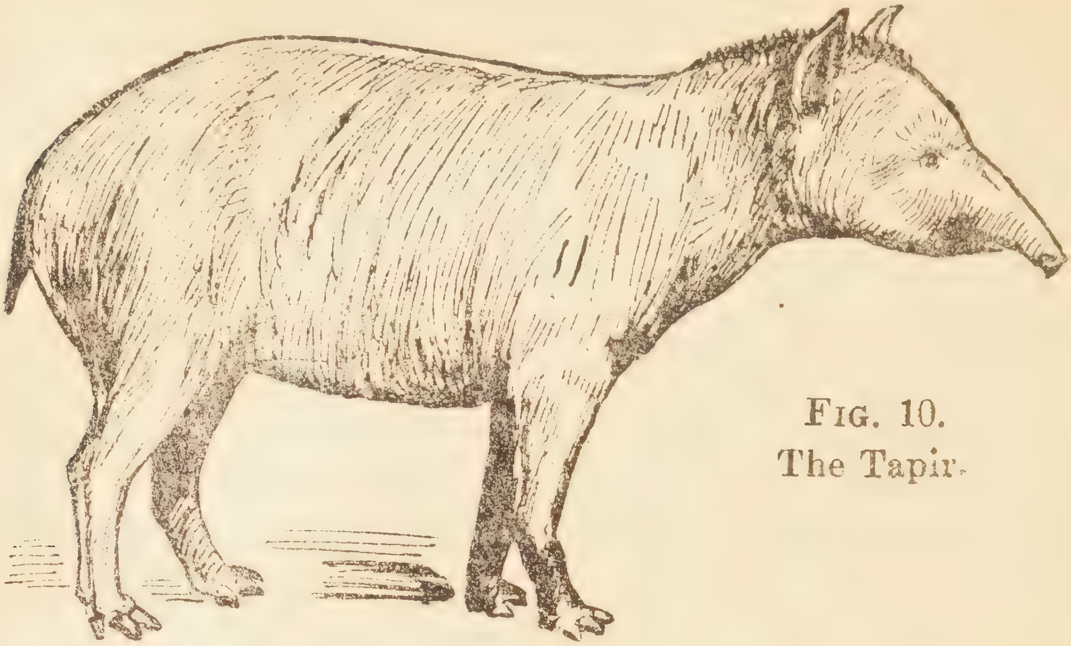

FIG. 10.
The Tapir.

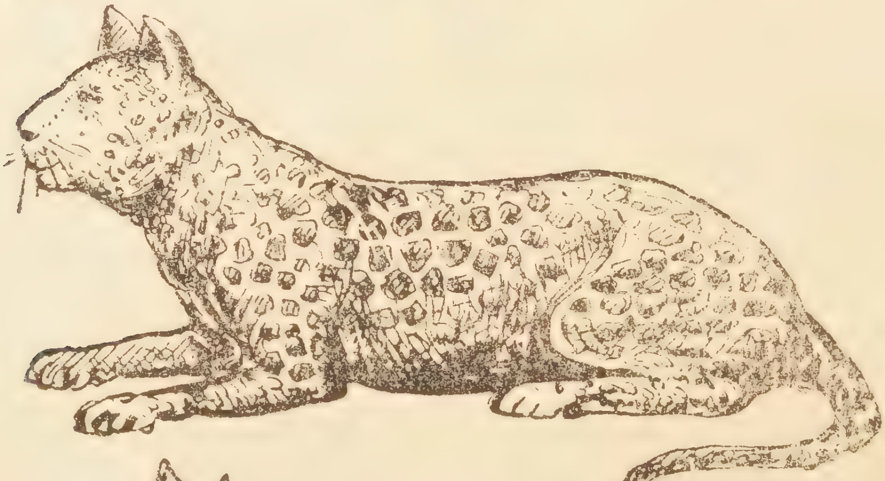

FIG. 11. The Jaguar or the South American Leopard.

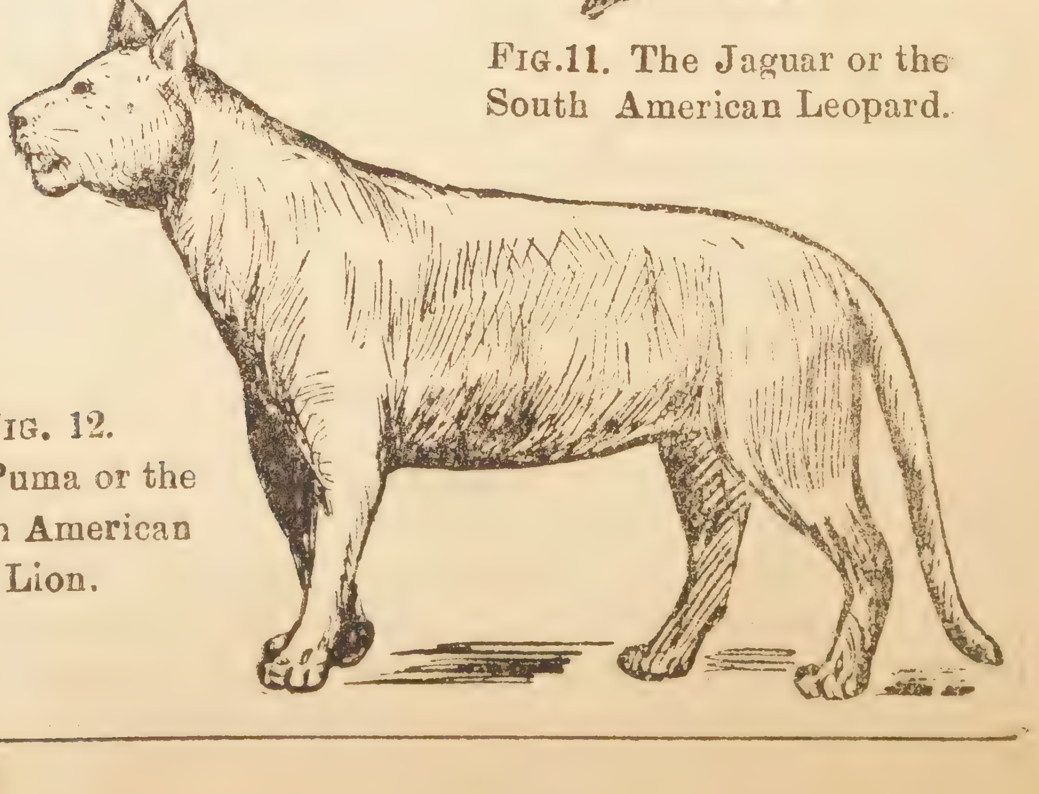

FIG. 12.
The Puma or the South American Lion.

of the snakes, sometimes attains a length of 40 feet and the *boa-constrictor* a length of 16 to 18 feet. The rivers abound in numberless fish and *alligators.* An animal peculiar to South America is the *tapir* (Fig. 10), a timid creature with a short trunk feeding chiefly on leaves and fruits. Of the beasts of prey the *jaguar* (Fig. 11) or South American leopard is by far the most dangerous. The *puma* (Fig. 12) commonly called the South American lion is harmless in comparison. There are many varieties of birds including the brilliantly coloured *macaws, parrots* and *parakeets.* The insects of the Amazon basin are dangerous and destructive, like those of the Congo forest. *Mosquitoes* that spread yellow fever, *ants* which burrow into the toes of human beings, *flies* that suck blood, *ants* whose sting is like fire—all these are in the forest and along the river edges.

Of the Andean animals the most important are the *vicuna,* the *alpaca* (Fig. 13), the *llama* (Fig. 14.) and the *guanaco.* The last is now met with chiefly in Patagonia. The llama (4½ ft. high), the original beast of burden of the continent, is used in the high passes of the Andes, as the *yak* is used in the Himalayas. The vicuna is generally met with in a wild state, while the llamas and alpacas are pastured in large flocks. These three animals provide food, clothing and wool. The skin of the guanaco is used by the natives in the making of tent-coverings and clothing. These four animals are strictly indigenous

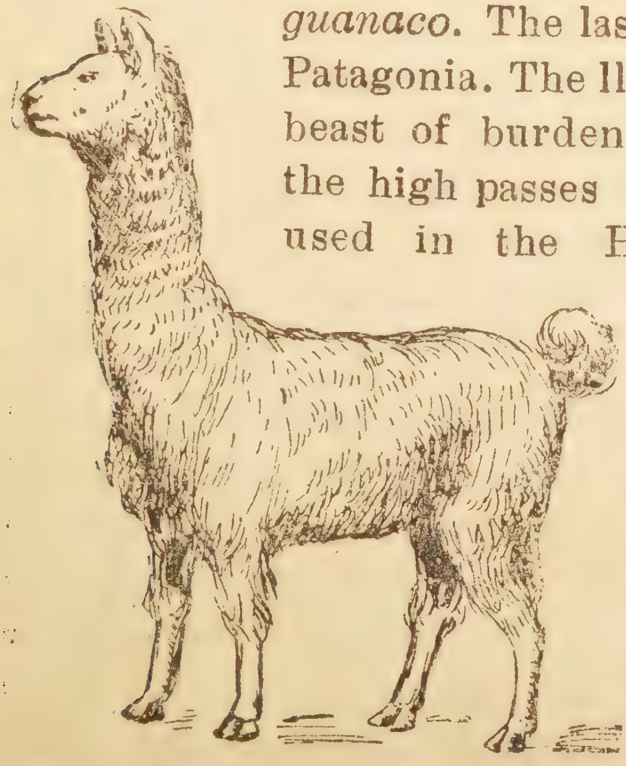

FIG. 13. The Alpaca

to South America and are to be met with nowhere else. The *condor*, the largest of the vulture family, breeds in the highest peaks of the Andes.

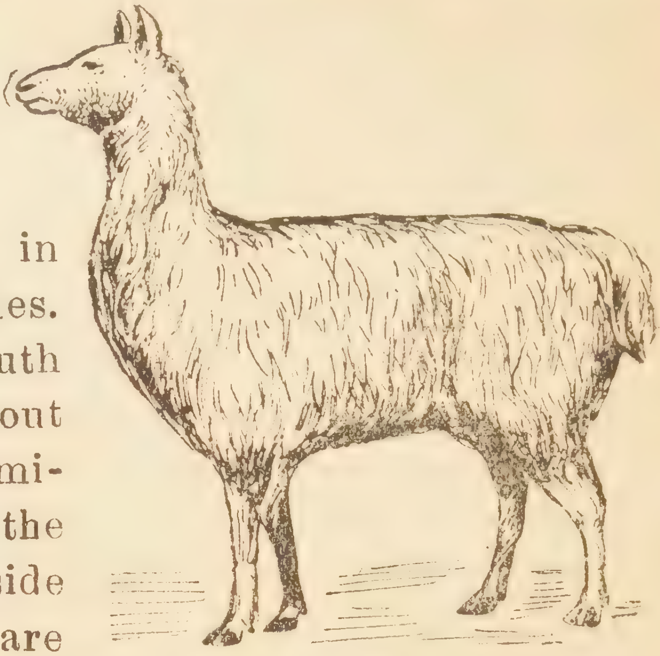

FIG. 14. The Llama

The *rhea* (Fig. 15) or South American ostrich roams about the pampas. It has been semi-domesticated and lives in the grass paddocks side by side with cattle. Its feathers are of much less value than those of the ostrich and are used for making dusting-brushes and similar articles. The ostrich has been introduced into Argentina with considerable success.

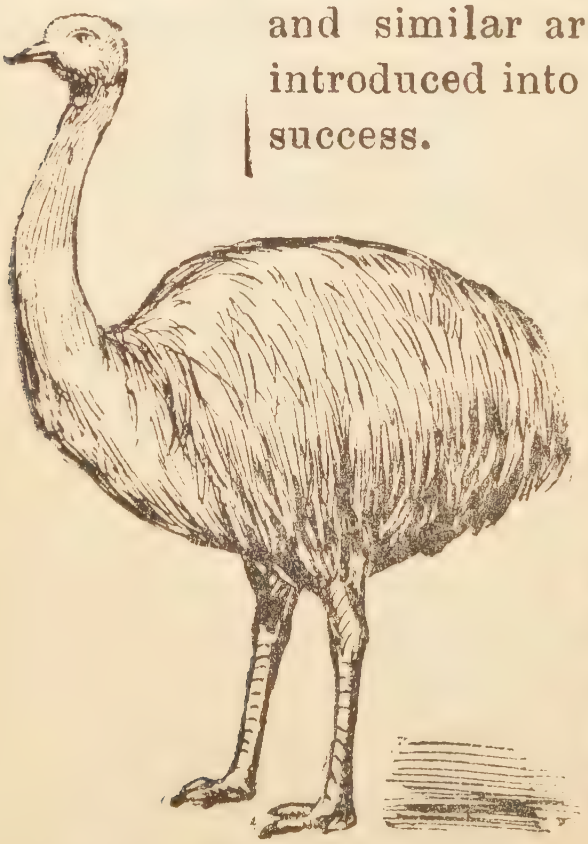

FIG. 15. The Rhea or the South American Ostrich

Like all the drier areas of the southern continents, the Plate lowlands suffer from locusts which do very great damage to the crops, especially maize.

Imported Animals:— Settlers from Europe have introduced into South America cattle, horses, mules, sheep pigs and goats. The plateau of Venezuela and the plains of the pampas represent the best cattle territories of the continent. The cattle of the tropical lowlands are useful for their hides and not for beef, because their hides are thick but their bodies are thin. Mules are used all over the continent as beasts of burden. Sheep thrive well on the pampas, in southern Patagonia and in Central Chile.

EXERCISES

(1) Show how natural vegetation follows rainfall.

(2) Draw a diagram to show that climate and vegetation vary with altitude.

(3) Explain : llanos, campos, pampas, montana.

(4) Describe the natural regions along the Pacific coast.

(5) How does the Patagonian desert differ from the Atacama ?

(6) In which of the natural regions marked on the map would you expect to see : (i) tree-dwelling animals, (ii) dangerous insects, (iii) llamas and alpacas, (iv) rheas ?

(7) In which regions do cattle and sheep thrive well?

CHAPTER IV

PEOPLES, STATES, POPULATION, INDUSTRIES AND COMMUNICATIONS

PEOPLES AND STATES

The original inhabitants of South America were '*Indians*' of whom many are to be found even to day. The most backward of these are met with in the Amazon basin, while in the interior the people are much more civilised.

Attracted by tales of the wealth of gold and silver of the continent, Spanish adventurers under *Pizarro* came in 1531 and conquered Peru, the great *Inca* empire. The Incas were a civilised race of people who had practised agriculture and mining. They had built many great cities and temples ornamented with gold and silver. In spite of natural difficulties, they had made splendid roads with bridges across rivers and gorges, and aqueducts to supply the people and the fields with water. The Spaniards destroyed this civilisation and treated the Indians most cruelly, using them as slaves to carry the precious metals to the coast.

After the Spaniards came the Portuguese, and so the continent had to be divided between them. Spain got the *Andean States*, and Portugal, *Brazil*

The Spanish settlers married Indians, and so the people of the highland States consisted of *Indians*, *Spaniards* and '*Mestizos*' (people of mixed descent). Later settlements were made south of the tropics, chiefly near the Plate estuary and in the fertile lands of Chile. The climate of these lands is suited to white settlers and so there has been a considerable immigration from Southern Europe. Hence in these regions there is a larger proportion of white inhabitants than in the tropical parts of the continent. In recent years there has been a great immigration of *Italians* to *Argentina.*

In Brazil the best lands are along the coast. Here plantations were formed, and to work on these plantations the Portuguese imported *negro* slaves from Africa. Hence in the greater part of Brazil the people are of Portuguese, Negro or mixed ("*Mulatto*") descent. In the south-east of Brazil there are settlements of Germans and other Europeans.

To-day none of the states belongs to Spain. Why? The Spaniards did not rule their possessions properly, but used them mainly for the purpose of supplying their mother country with vast quantities of gold, silver and other minerals. The official class was greedy and corrupt. So in the early part of the nineteenth century the settlements rebelled and threw off the Spanish yoke. They all became *republics* after the model of the United States,

Brazil is no longer Portuguese, but it should be noted that the conquest of Brazil was not so cruel as the Spanish conquests. So the break with Portugal when it came was a gradual one, and was achieved without serious bloodshed. [illegible]

The Guianas are now owned by Britain, Holland and France. As the lowlands along the coast are hot and wet, there are few European inhabitants, but there live many Negroes, Chinese and East Indians who have been brought there as labourers. The interior is mainly peopled by the aboriginal Indians.

Trinidad and *Falkland* Islands belong to the British.

Spanish is the language spoken everywhere except in the Guianas and in Brazil where *Portuguese* is spoken.

THE STATES AND THEIR CAPITALS :—(Fig. 16)

States		Capitals
Republics	Brazil	Rio de Janeiro
	Venezuela	Caracas, (Port : La Guaira)
	Colombio	Bogota
	Ecuador	Quito, (Port : Guayaquil)
	Peru	Lima, (Port : Callao)
	Bolivia	La paz
	Paraguay	Asuncion
	Uruguay	Monte Video
	Argentina	Buenos Aires
	Chile	Santiago (Port : Valparaiso)
British Guiana		Georgetown
Dutch Guiana		Paramaribo
French Guiana		Cayenne

Of these states Bolivia and Paraguay alone have no sea coast ; but Bolivia has rights of access to the Pacific coast by railways crossing northern Chile, and Paraguay is connected by river and railway with the ports of the Plate estuary.

Argentina, South Brazil and Chile (The "A B C" of South America) are the countries of temperate South America, and it is naturally there that most of the people of European descent are found.

The governments of many of the States have been unstable so that there have been many revolutions accompanied by bloodshed and the destruction of property.

Again there have been repeated quarrels between neighbouring states about their frontiers which during the Spanish rule had never been accurately defined. These revolutions and inter-state quarrels have retarded the

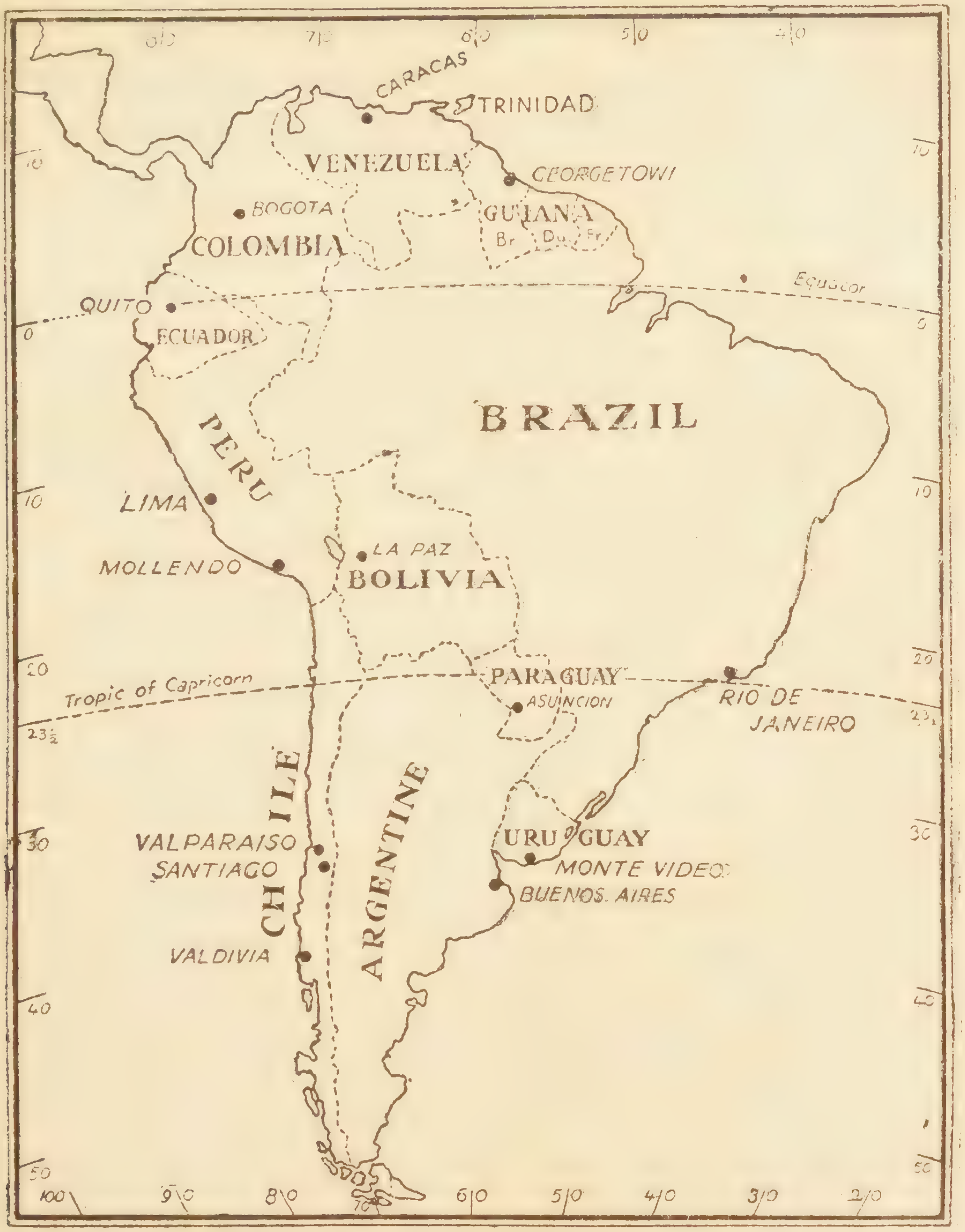

FIG. 16. South America: Political Divisions.

progress of the continent as a whole. Now that all the states have joined the League of Nations, it is to be hoped that future disputes will be peacefully settled.

South America has not shared the fate of Africa, where there was during the 19th century a great '*scramble*' for territory among the great states of Europe; for "early in that century the United States declared that no European power would be allowed to intervene in the politics of

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South America or to increase its territory in the New World. This policy was laid down by President Monroe, and is therefore known as the 'Monroe Doctrine', and no European nation has interfered with the continent in the face of the policy."

DISTRIBUTION OF POPULATION (Fig. 17)

The estimated total population of South America is 76 millions ; so the average density of population is about 11 per square mile. Hence South America like the other southern continents is thinly peopled. Look at Fig. 17 showing the distribution of the population. You find three areas somewhat densely peopled: (i) the land around the Plate estuary, (ii) the fertile valley of Central Chile and (iii) the coffee districts behind Rio de Janeiro and other centres of plantation in Brazil. We have already seen that the climate of Argentina, South Brazil and Central Chile (the 'A B C' of South America) is suited to Europeans, and the rapid developments that have taken place in these areas during the last quarter of a century have led to a steady immigration of Europeans mainly from the Mediterranean countries. These lands are capable of further development and so in time they will have a greater population than now.

But there are other parts of South America which will never have many people living in them—the hot, wet densely forested Amazon basin, the dry Atacama Desert and the Shingle Desert of Patagonia and the snowy uplands of the Andes. The lowland areas of tropical South America have a very unhealthy climate, being subject to deadly fevers. But owing to the great advance made by tropical medicine in recent years, fever has been banished from a number of the tropical coastal towns. Another

[illegible] had [illegible]
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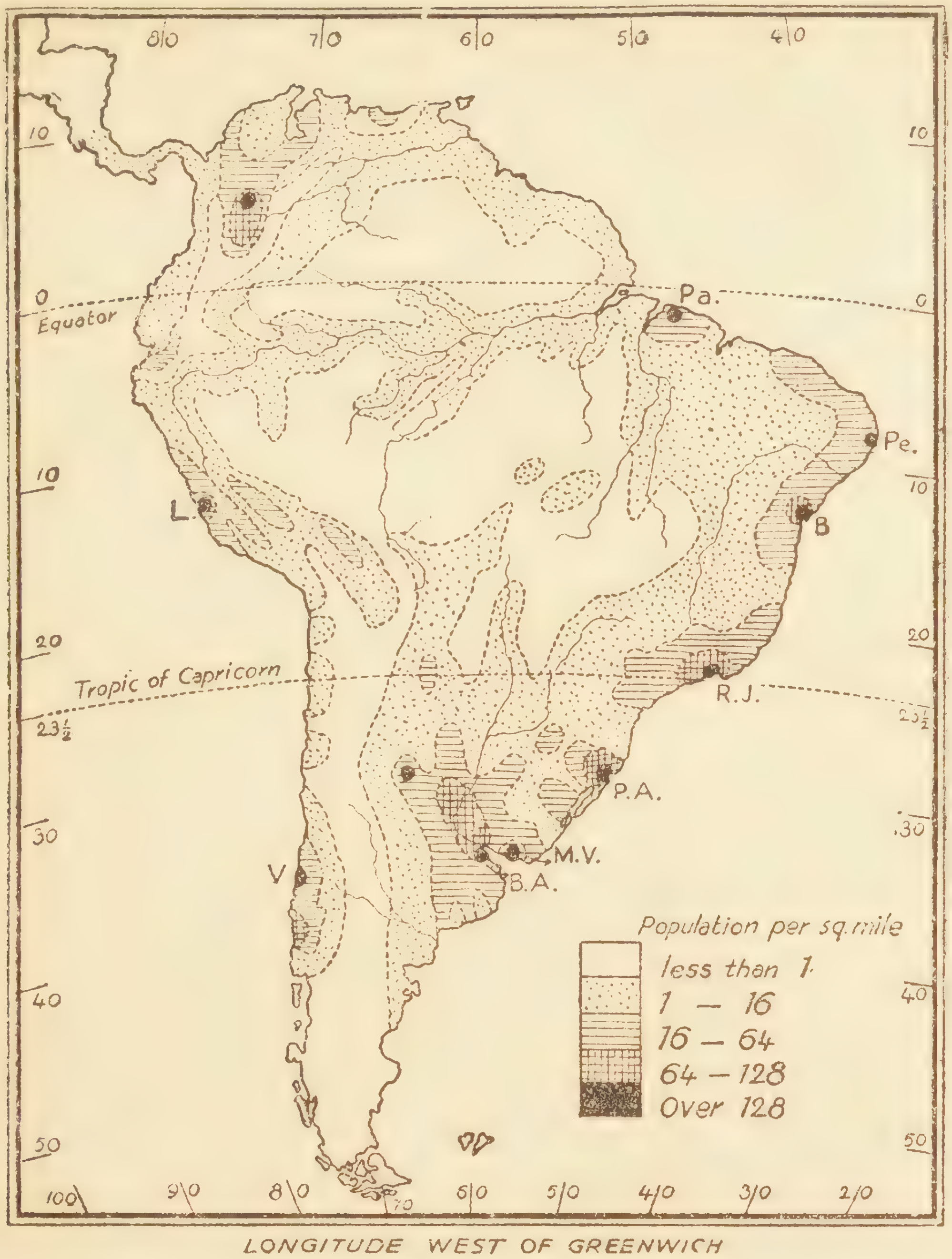

FIG. 17. South America: Distribution of Population

reason for the thin population of tropical South America is the high death-rate among Indians and Negroes owing to their ignorance and neglect of hygiene.

PRODUCTIONS AND INDUSTRIES (Fig. 18)

The people of South America, like those of Africa and Australia, have been mainly engaged in primary produc-

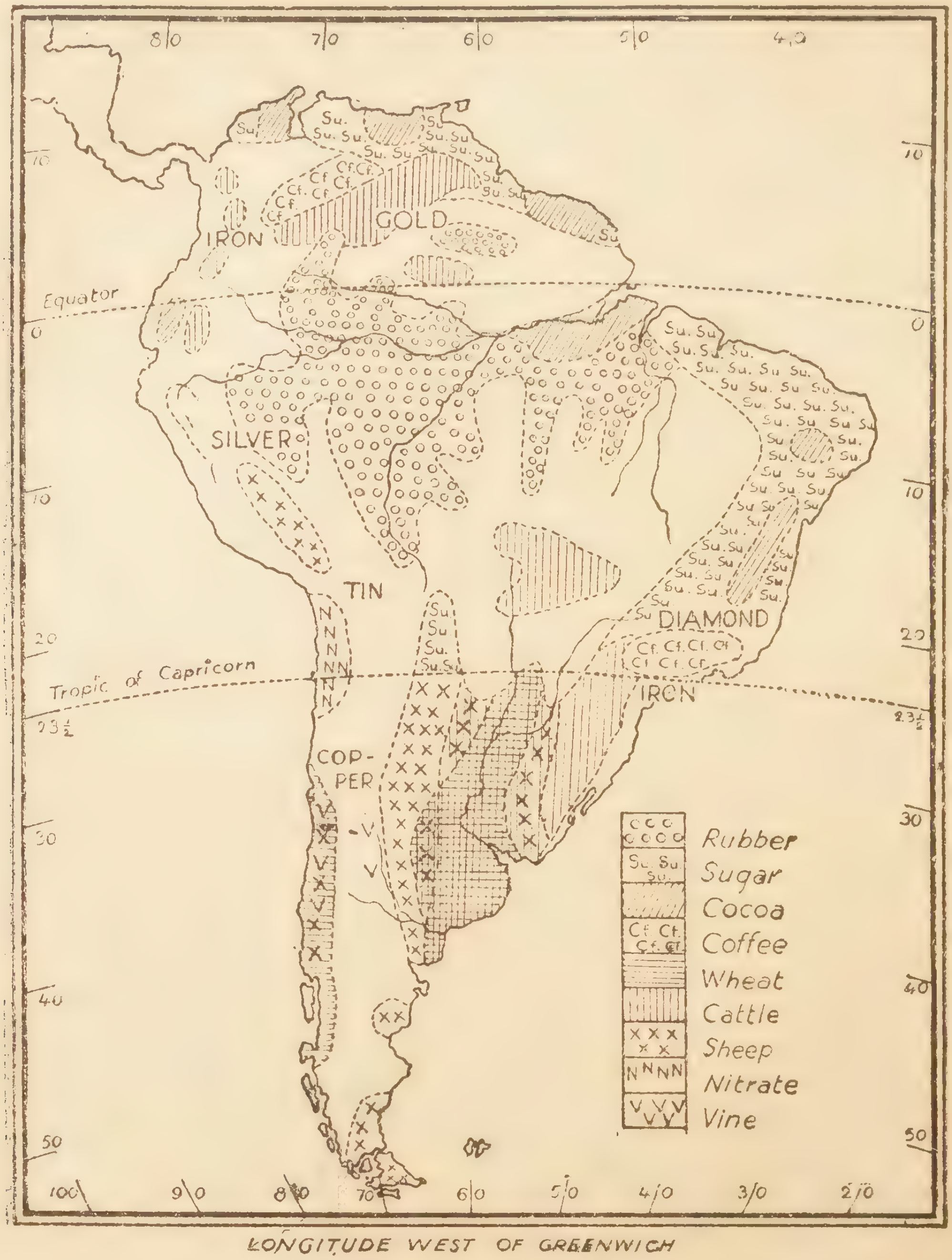

FIG. 18. South America: Productions

tions. The main sources of the wealth of the continent are mining, stock-rearing and agriculture.

Mining: You know that it was the mineral wealth of the Andes that first attracted large numbers of Spaniards to South America. They developed the mineral resources of the Andean States with the help of native labour.

Gold occurs in the mountain districts of Venezuela, Colombia, Ecuador and Peru. *Silver* is found mainly in the Central Andes. It is found associated with other metals: in Peru with copper and lead, and in Bolivia with tin. The chief silver mines are *Cerro de Pasco* in Peru and *Potosi* in Bolivia. The mines of Peru are connected by a railway with *Callao* on the coast and those of Bolivia are connected with *Mollendo*, *Arica* and *Antofagasta*. But the leading mineral produced in the Andes, in point both of value and of quantity is *copper*. This is mined in Peru, Bolivia, North Chile, and also near Santiago (Central Chile). Bolivia is rich in *tin* and silver, and contains also deposits of gold and *bismuth*; but *tin* forms the greatest of the country's exports. Bolivia, in fact, stands second among the tin-producing countries of the world, the first being the Malay Peninsula.

In spite of the great wealth in ores, mining in Central Andes, especially in Bolivia, labours under a number of difficulties: (1) the altitudes are very high (14,000 to 16,000 ft.); (2) transportation is very expensive; (3) fuel (coal or firewood) is scarce; (4) labour is difficult to get; as the region is unproductive and can therefore support only a scanty native population; and (5) new arrivals unused to such altitudes feel much discomfort.

The Andean region has two rare and valuable minerals, namely *platinum* and *vanadium*. The former is found in Colombia and the latter Peru, where there are also important deposits of *mercury* ores.

The Brazilian plateau is also rich in minerals, the chief mining areas being the States of Minas Geraes and Bahia. Gold, diamonds, copper, iron and manganese have been discovered. Diamantina is one of the districts where diamonds are found. The mineral districts of the south are connected by railway with Rio de Janeiro.

Coal of good quality is not found in the continent and it is therefore imported from Australia. *Petroleum* is found in Argentina, Bolivia, Peru, Colombia and Venezuela (round Lake Maracaibo). The Atacama Desert has rich deposits of *nitrates* which have been preserved by absence of rain. These with guano (dung of sea birds) are exported to foreign countries to be used as fertilisers for fields.

Stock-rearing : In the Argentine Pampa region great advance has been made in the rearing of sheep and cattle. In South Brazil, Uruguay and in South Patagonia, similar progress has been made. The Peruvian plateau is likely to develop into a great sheep-farming region. Thousands of cattle and goats are reared in the tropical parts of South America, in North-eastern Brazil, in Matto Grosso, in Paraguay, on the Llanos of the Orinoco, on the Northern Colombian plains and on the borders of the Chaco. The quality of the animals, however, is everywhere poor. As a general rule the animals of the tropical part of South America are subject to destructive diseases.

Agriculture : In the temperate parts of South America namely Argentina, Chile and Uruguay, agriculture is generally in a thoroughly prosperous condition, wheat being the chief crop. Maize is grown in the wetter regions.

In the tropical regions of the continent, there are at present almost unlimited areas available for cultivation. Such tropical products as cacao, rubber, sugar-cane and manioc and sub-tropical products as cotton and coffee are grown. Cacao, manioc (from which *tapioca* is prepared), mate tea, cinchona, tobacco, potatoes and rubber are indigenous plants. Cacao sugar, cotton and tobacco are cultivated chiefly on the plantations along the coastal plains and coffee on the adjoining highlands. The only large-scale production in tropical South America is the coffee-growing of Southern Brazil.

Manufacturing: Manufacturing industries are not likely to develop on a large scale in the near future as the continent is poorly provided with coal deposits. But petroleum is believed to exist in large quantities along the eastern foot of the Andes, and large areas will probably be able to derive power from petroleum. Again, South America has a large number of rivers with waterfalls which can supply her with electric power. In recent years power stations have been erected in East Brazil and South Chile. Water power has been applied to the textile and leather industries that have been established at Sao Paulo and Rio de Janeiro.

COMMUNICATIONS (FIG. 19)

Rivers: Four great navigable rivers give access to the interior of the continent, namely the Amazon, the Paraguay-Parana. the Orinoco and the Magdalena. The southern tributaries of the Amazon, except the Madeira, are not navigable as they have falls in their lower courses: but the Madeira is navigable up to the Bolivian frontier. Navigation on the Upper Parana is impeded by falls.

Roads: Throughout the period of colonization by the Europeans the chief means of transport were mules and horses. Between the coast and the plateau communication was maintained by means of mules, while the horses were used on the southern plains. There are no good roads in South America: in the wet tropical parts they are costly to construct and maintain; on the west coast the sandy surface is unfavourable to road-laying; the west slopes of the Andes are too steep for road making; on the Pampas road-building materials are absent. With the introduction of motor transport some attempt is being made to lay out useful roads.

In the dark forest paths of the Selvas, South American Indians carry loads on their backs; along the waterways they use their dug-out canoes or rafts.

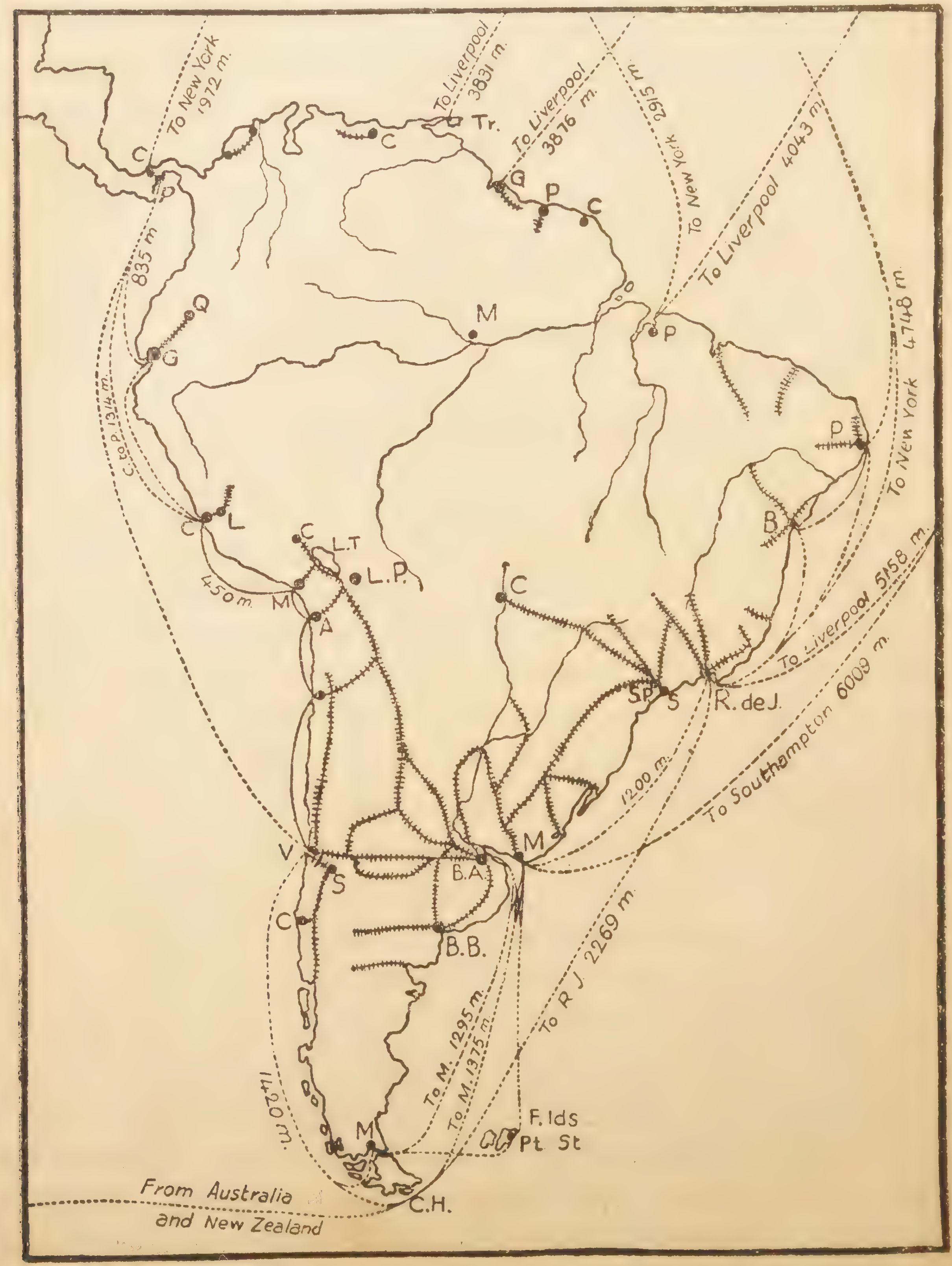

FIG. 19. South America: Communications

Railways: Railways began in South America in the same way as in Australia, namely as isolated lines acting as feeders to the ports. Therefore there is no uniformity of gauge. Now many of the lines have been linked up, but the multiplicity of gauges increases the difficulty of establishing through service from one state to another. Even in the same state there are sometimes different gauges, *e.g.*, from the plantations in Brazil coffee is brought to Sao Paulo on metre gauge lines, but has to be transferred to the broad gauge line to Santos. With the scarcity of roads and lack of navigable rivers in the populous parts of the continent, railways tend to become more and more important.

The following are some of the important railways;

(1) *The Trans-Andine Railway* between Buenos Aires and Valparaiso *via* the Uspallata pass. There is a change of gauge both on the Argentine as well as the Chilean side. The route is therefore useful mostly for the carriage of passengers and mails.

(2) *The line connecting Rio de Janeiro and Montevideo.* There is no great saving of time as compared with the sea route.

(3) *From Buenos Aires to La Paz in Bolivia* which is connected with *Antofagasta*, *Arica* and *Mollendo* on the west coast. Through service between Argentina and Bolivia is possible as the lines in both the states are on the same gauge. The line from *La Paz* is continued northward as far as *Cuzco* (the old Inca capital) in Peru.

Two regions are now served by a network of railways: (1) the Argentine Pampa; (2) the coffee district of Sao Paulo in Brazil.

The Peruvian railway is a remarkable feat of engineering skill. The line from *Callao* ascends up the *Rimac* to a height of 15,665 ft. and then descends to 12,000 ft. to Oroya whence it is taken to *Cerro de Pasco*, the mining centre.

Short lines have been constructed round falls and rapids as on the Madeira, the Magdalena and the Sao Francisco. *Cf.*, the lines round the falls of Congo.

Sea-route : Sea routes play an important part in communication between one part and another of those countries whose populations are scattered along the coasts ; *e.g.*, Brazil, Peru and Chile.

The sea-borne trade of South America has been increased by the opening of the Panama Canal. The Pacific region as far south as North Chile has been brought within easy reach of the North Atlantic. This part of South America which was formerly isolated is now having commercial relations with Western Europe and Eastern North America. As it is nearer to the United States than to Europe, most of its trade is being carried on with that country. The Straits of Magellan have lost some of their former importance as a commercial highway but they act as a check against overcharges on the Panama route. The *Panama Canal ship routes* and those from Europe to the east and south-east of the continent form an important factor in the development of South America.

The following figures illustrate the advantage gained by the Western South American ports by the construction of the Panama Canal :—(Figures represent distance in miles).

From	To	Via Cape Horn.	Via Panama Canal.	Distance saved.
New York ...	Iquique	9,221	4,021	5,200
New Orleans ...	do.	9,621	3,420	6,201
Liverpool ...	do.	9,591	6,760	2,831

EXERCISES

(1) Name the parts where (i) Spanish, (ii) Portuguese is the chief spoken language.

(2) Name the British possessions in South America.

(3) "Most of the people of South America live near the sea." Why? Why are lands of the Plate River more thickly peopled than the Amazon lands?

(4) What are the drawbacks to the development of the mining industry in Bolivia?

(5) Draw a map of South America showing the centres of mineral production.

(6) Explain: "The harvest of the deserts of South America ensures the harvest of the world's fields."

(7) What advantage has the coastal land of Peru for cultivation?

(8) Where do you find a net work of railways in the continent? Give reasons for your answer.

(9) Make a map showing the Trans-Andine railway between Valparaiso and Buenos Aires. Why is this line said to be useful to carry only passengers and mails?

(10) How does the opening of the Panama canal increase the trade of the western Sonth American ports?

CHAPTER V

THE TEMPERATE COUNTRIES OF SOUTH AMERICA (Fig. 20)

ARGENTINA

The word '*Argentina*' means '*Silver land*'. This does not mean that silver was mined here, but that the country with its river (Rio de La Plata) estuary formed the route by which the silver mines of Peru and Bolivia were once reached. Argentina extends from a little north of the Tropic of Capricorn to Cape Horn. It falls into three natural divisions: (i) *the northern forest and savannah,* (ii) *the central grassland,* and (iii) *the southern Patagonian region.*

(i) **The northern portion** is warm temperate and consists of woodlands called "*El Gran Chaco*" (the grand chase or great hunting ground) and plantations. The woodlands are undeveloped on account of their distance from the coast, insect pests and the hostility of the Indian tribes. Along the Parana-Paraguay there is the *Quebracho* region. The wood of the Quebracho (=axe breaker) tree is very hard, strong and durable. So it is highly serviceable for building purposes and for making posts and railway sleepers. In the drier parts cotton is grown. *Tucuman* (70,000)* is the chief centre of the plantation area where *sugar, maize* and *tobacco* are cultivated. The town is reached by a railway which is continued northward into Bolivia. Cattle and mules are reared on the eastern side of the Andes and many of these animals are sent to the mining centres of Chile and Bolivia.

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*Figures after towns refer to the population.

(ii) **The Central region** is the most important part of

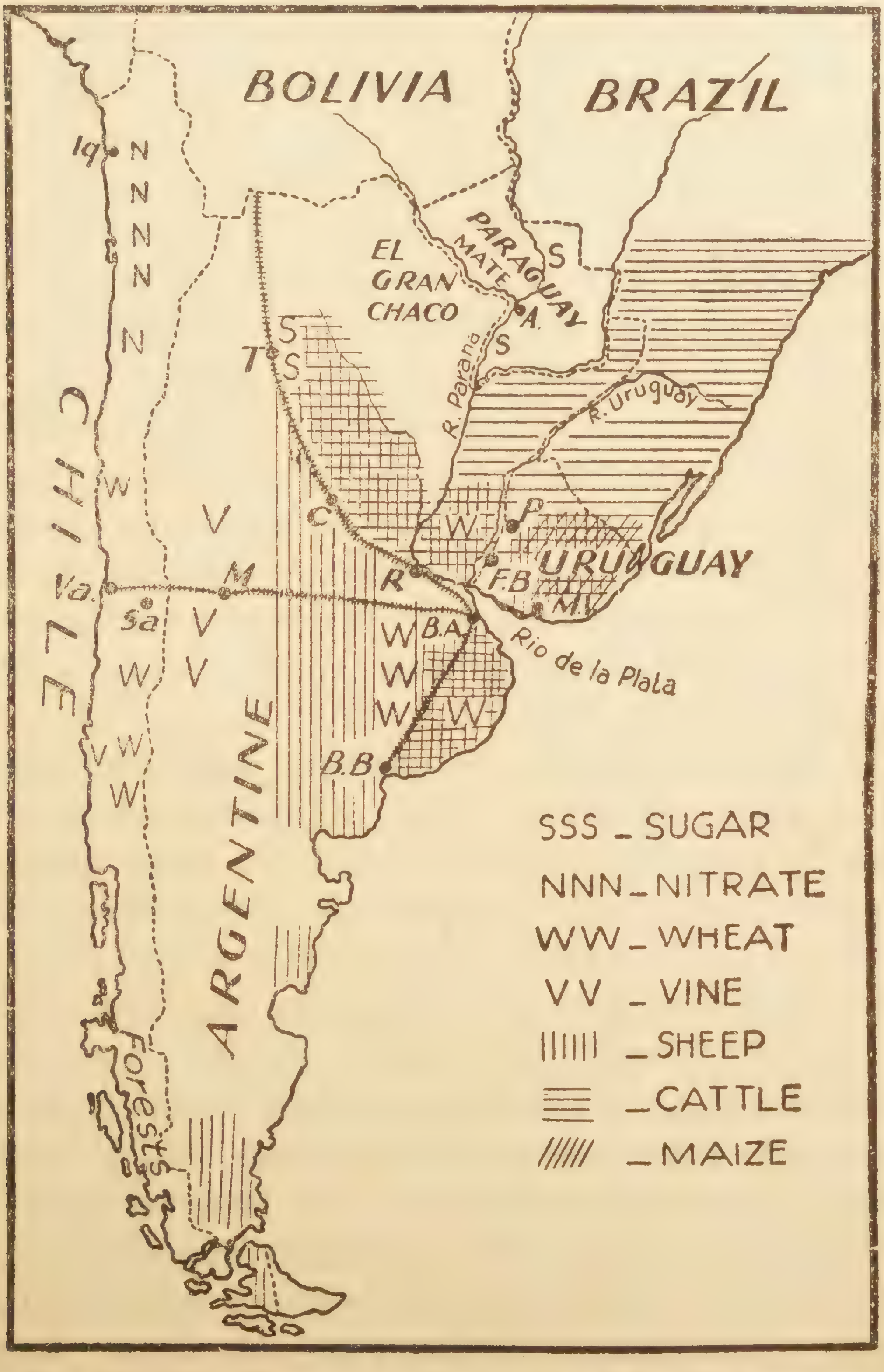

FIG. 20. The Temperate Countries of South America.

Argentina. The true *pampa* extends from the Atlantic about halfway across the country. This 'sea of grass' supported many wild animals, which have now been replaced by *horses*, *cattle* and *sheep*. Some of the great *estancias* or farms cover more than half a million acres. The animals are looked after by native cow-boys or the *Gauchos*. The horses are so common and numerous that no one ever walks on the pampas. The cattle are reared chiefly for beef and not for milk. The *alfalfa*, a deep-rooted plant, provides excellent fattening fodder for cattle. The number of cattle is increasing while that of sheep is declining. "Between 1914 and 1922, cattle increased by over 11 millions, while sheep declined by over 7 millions." These animals are sent to great factories, called *frigorificos*, where they are killed and prepared for export as frozen or chilled meat. *Cardoba* (160,000) is the chief centre of the ranching area, and from here wool, hides and skins, frozen meat and tallow are exported through Buenos Aires at the mouth of the Plate River.

The eastern side of the Pampas has spring rain, fertile soil and a dry summer. These conditions are favourable to *wheat* which is therefore produced in large quantities. The wheat is harvested in January, the northern winter, when there is no wheat in the fields of the northern continents. *Maize* is also cultivated, especially in the districts east of the lower Parana. *Rosario* (270.000) on the Parana is the chief collecting centre and can be reached by large steamers. the Plate estuary being kept deep by constant dredging. At the southern end of the Pampas, on a fairly good harbour lies *Bahia Blanca* another important port for wheat and meat. Here there are freezing works and grain elevators which provide facilities for this town. It is the naval station of Argentina.

The region west of the Pampas is on the leeside of the Andes and therefore dry; but the mountain streams provide water for irrigation. The dryness of the summer air is favourable to fruit cultivation. *Mendoza*, on the Trans-Andine railway, produces large quantities of grapes, and so wine-making is an important industry there.

(iii) **Patagonia** consists of two regions, the stony semi-desert in the north and the steppe in the south. The whole region which was once considered a waste has now many flourishing sheep farms along river courses and in the extreme south, which is supplied with some moisture by the west winds, as the Andes are somewhat low there. Again the snow that falls in winter melts in summer and helps the growth of grass. The eastern side of Tierra del Fuego belongs to Argentina.

The rapid development of Argentina is due to the network of railways whose construction has been made possible by the flatness of the land. Manufacturing industries other than those connected with the preparation of meat and the milling of wheat are not as yet of much importance; for the country has little coal and the streams are too slow-flowing to give power. The eastern districts of Buenos Aires have some dairy industry. Wool, cattle, hides, meat and corn are the staple exports which are sent to England and other European countries. The imports are manufactured goods, coal and oil.

Buenos Aires (2,310,441) (='good air'), the capital and chief port of Argentina at the mouth of the Plate River, is the chief outlet for the agricultural and pastoral products of the country. It is the largest city in the world south of the equator. It has a very poor natural harbour as the Plate estuary is shallow; but an artificial harbour has been made at a great cost. All the main railways of Argentina radiate from this city. The total population of Argentina is 11 millions.

URUGUAY

Uruguay forms part of the Pampa region. It is a small state with a population of 1½ millions, bordered on the west by the Uruguay River and on the south by the Plate estuary. It is suitable for cattle and sheep rearing and for the growth of maize. The chief exports of the country are wool, hides, meat and meat extracts (*e.g.*, Oxo, Bovril). There are large extract works at *Fray Bentos* and *Paysandu* on the Uruguay. *Monte Video* (450,000), the capital and chief port, owes its importance to its position on the Plate estuary; but its harbour is not deep. All the railways of Uruguay radiate from here. Freezing works have been in existence here for a long time.

CHILE

Chile is a narrow country lying to the west of the Andes. It falls into three natural divisions.

(1) **The northern division** is a rainless desert, but it contains valuable deposits of *nitrates* in the longitudinal valley and rich mines of *copper* in the high Andes and the coastal mountains. *Iquique* is the chief port for nitrates. *Antofagasta* in addition to the nitrate trade joins in the export of Bolivian mineral wealth. Drinking water is brought to these desert towns in long pipes from the distant mountains. Compare the Coolgardie and Kalgoorlie gold mines of Western Australia. Chile stands second among the copper-producing countries of the world. Nitrates form the most valuable item in the export trade of the country, and the taxes and duties levied on the product form a large part of the state revenues.

(2) **The middle section** has a 'Mediterranean'

climate and is most suitable for human habitation. The long narrow valley between the coast range and the Andes is the real Chile. The coast range makes the valley dry, and the warm dry climate of the valley is suitable to wheat, barley and fruits, chiefly grapes and oranges. Chile is famous for its wine. The mountain slopes are dotted with stock-farms where cattle, sheep and goats are reared. *Coal* is mined in the districts near *Concepcion*. Fruits, grain, meat, wool and hides form the chief exports. Some iron is also mined and exported.

Santiago (547,588), the capital of Chile, is in the long valley at a height of 1,800 feet. *Valparaiso* (=' valley of paradise') (189,039), the chief port, is on a horse-shoe shaped harbour opening to the north. It is connected with Buenos Aires on the east coast by the trans-continental railway. The majority of the four million inhabitants of Chile are of European origin and all of them live in the central region, for its climate is suited to them.

(3) **Southern Chile** is cold and wet and its mountain sides are covered with forests. Some lumbering is going on, but it is not well developed. Hunting and fishing form the chief occupations of the people in the south. There are *seal-fisheries* in the *skerry-fence*. From Chiloe Island to 53° S.L. South Chile is uninhabited ; but in the extreme south-eastern part lies an area devoted to sheep rearing. The western part of Tierra del Fuego belongs to Chile.

The *Falkland Islands*, 300 miles east of Magellan Strait, are British Colony. The climate is cold and wet and so no cereals can be grown. Owing to the strong winds which blow here nearly all through the year there are no trees. The islands support more than 600,000 sheep. but the population is only 3,800. Sheep-farming and whaling are the chief occupations. *Port Stanley* on the eastern island is the chief town and a port of call for ships in need of water, food or fuel. Whale produce, wool and meat are the exports.

EXERCISES

(1) Draw a map of the central portion of Argentina. Mark the rivers flowing into the Plate estuary, Buenos Aires and Montevido. Show also the trans-continental railway connecting Buenos Aires and Valaparaiso.

(2) What causes have led to the development of Buenos Aires?

(3) "Argentina is a great pastoral and agricultural country." Why? What drawbacks are there for the development of its manufacturing industries?

(4) What geographical causes have made Bahia Blanca an important town?

(5) What is the economic importance of Northern and Central Chile?

(6) How do the towns of Northern Chile get their water supply?

CHAPTER VI

THE TROPICAL COUNTRIES OF SOUTH AMERICA (Fig. 21)

BRAZIL

Brazil, "the world's chief storehouse of tropical products," is the largest country in South America, and is nearly twice as large as the Indian Empire, but its total population is estimated to be only 37 millions, Why? The whole of the country lies in the hot zone and gets abundance of rain except in the extreme east. Hence the interior valley and plains and the coastal lands are covered with tropical forests. The most important product of the lowland forests of the Amazon valley is *rubber*. *Manaos* (75,764) near the meeting place of the Negro and the Amazon, nearly 1,000 miles inland, is the chief collecting centre for rubber. *Para* (236,402) near the mouth of the Amazon is the chief rubber port.

Rubber-gatherers have either cut down many of the easily accessible trees or drained them of the sap so completely that they may require years to recover productivity. The gathering of rubber has now declined because it has become difficult and less paying owing to the competition of the Asiatic plantations where labour is cheap. In 1913 South America's share of the total export of rubber of the world was 39·5 per cent, but in 1928 it was only 3·8 per cent. For the current year it is estimated to be 2·5 per cent. So, collecting *Brazil nuts* is now taking the place of rubber-gathering. The fruit of the tree which sometimes grows to a height of 200 feet, contains from 15 to 30 nuts. These nuts contain about 73 per cent of edible oil and are therefore largely consumed by the people of north Brazil. Besides rubber and nuts, medicinal plants like *cinchona*, *ipecacuanha*, *sarasaparilla* and *coca* are found. From the bark of the cinchona tree *quinine* is obtained

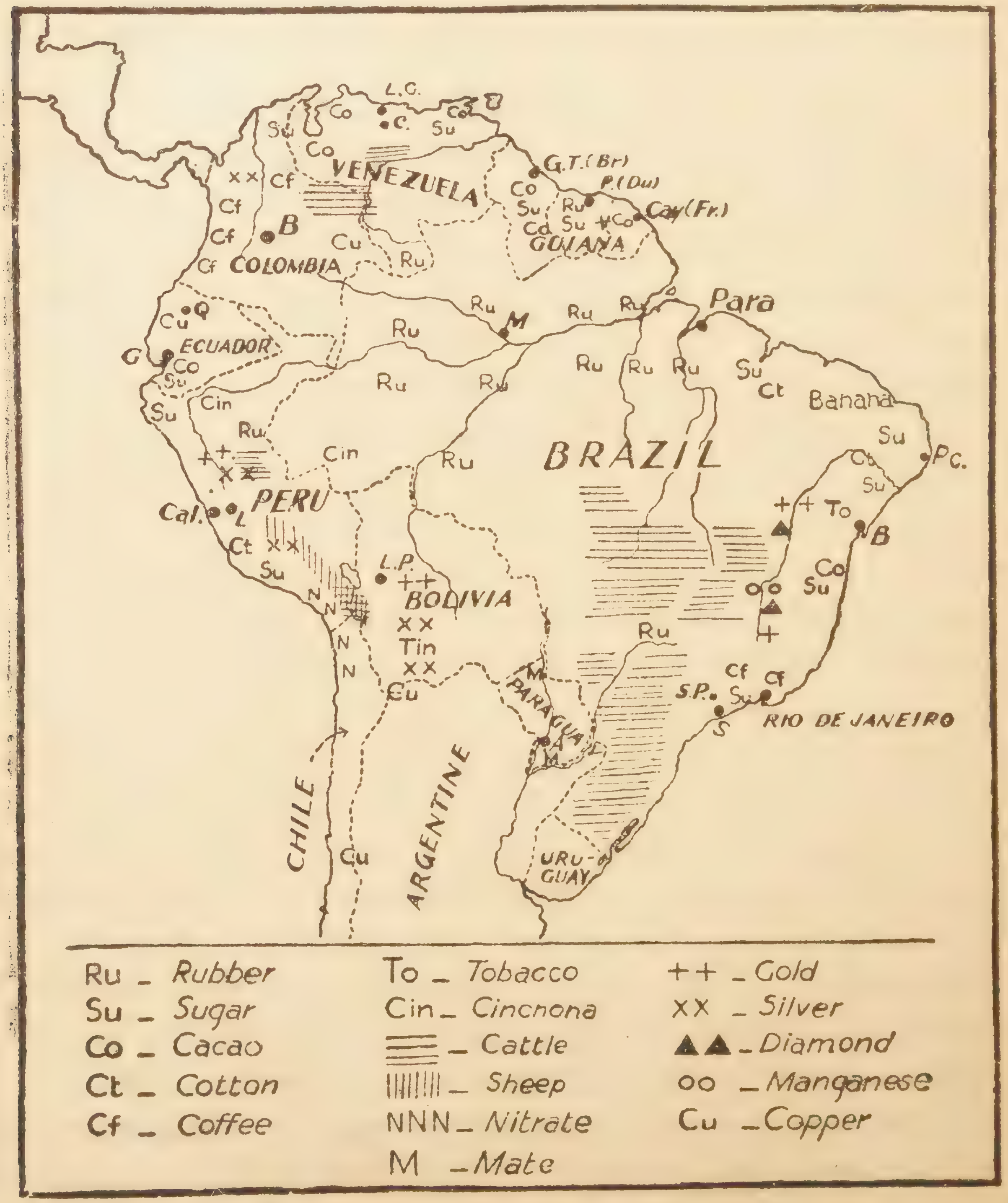

FIG. 21. The Tropical Countries of South America

The chewing of the coca leaf wards off fatigue and hunger. Now more attention is being given to the cultivation of crops, especially in the State of Para. *Sugar-cane, cacao, mandioca, rice* and *bananas* all do very well in many parts of the valley.

The forests of the coastal plains have been cleared and there are important plantations *cacao, sugar-cane, coffee, cotton,* and *tobacco*; but the most valuable of all these products is coffee. This requires great heat, moisture and a soil rich in decayed vagetable matter, but it also needs protection from too heavy rains and strong winds. Hence the coffee plantations are inland among the hills and on the plateaus. The districts round *Sao Paulo* (800,000) and *Rio de Janeiro* (1,500,000) are ideal places for coffee. Here the red soil is rich in iron and this is good for the plant. Brazil produces nearly four-fifths of the world's supply of coffee and the State of Sao Paulo alone upwards of one-half. *Santos* is the port of Sao Paulo. Coffee estates or *fazendas* sometimes cover an area of 30,000 acres. Sugar, maize and rice are also cultivated here to be used as food for the work-people.

Buenos aires ?

Rio de Janeiro, the second largest city of South America, is the capital of Brazil. It is situated on a magnificent land-locked harbour and is connected by railway with the interior and the towns of Uruguay. It is the chief port for all the products of the interior, chiefly coffee. *Pernambuco* (238,843) in the north has a natural harbour protected by a reef and is the port for sugar and cotton. Further south is *Bahia* (283,422), the chief port for sugar and tobacco. Rice, maize and tobacco are cultivated also in South Brazil. *Yerba mate* or Paraguay tea is widely grown and exported in large quantities, chiefly to Argentina.

On the grasslands of the central and southern plateau, cattle are reared. Freezing works have been established at Sao Paulo and Santos. The cattle of the Matto Grosso are so poor in quality that they are artificially fattened before they are sent to the freezing works. Brazil is one of the most important pig-rearing countries of the world, maize being widely used to fatten the animals.

The mineral wealth of Brazil has already been referred to. As cheap water power is available *textile* and *leather* industries have been established at Sao Paulo and Rio de Janeiro. The cotton, woollen, jute and silk goods manufactured here amount to 85 per cent of the domestic consumption. Boots and shoes are also manufactured. Most of the jute comes from India and is made into bags used for packing coffee, cocoa, sugar and rice.

The exports of Brazil are coffee, sugar, frozen meat, tobacco, leather, cocoa, cotton, mate tea, rubber and hides; but coffee is by far the most valuable export, forming more than 60 per cent of the outgoing trade. The imports are manufactured goods of all kinds, wheat, coal and wines. The chief trade is with the United States, Great Britain and Argentina.

THE GUIANAS

The Guianas produce sugar, coffee, cocoa, bananas, rice and cocoanuts along the coast. Gold and some diamonds are mined in the highlands. *Georgetown*, the capital of British Guiana, is the most important centre.

VENEZUELA

In Venezuela (=Little Venice) the people are of mixed descent. On the uplands coffee is grown while from the lowlands sugar, tobacco and cocoa are obtained. The llanos produce cattle and hides, whilst rubber is obtained from the coastal area and the Amazon lowlands. From the Upper Orinoco and the Rio Negro a kind of rubber-like gum is obtained and this gum is called *balata*. *Caracas* (150,000) the capital is connected by a railway with the port *La Guaira*. Near the shores of *Lake Maracaibo* petroleum is obtained and sent to America and Europe.

The British island of *Trinidad* which lies near the north-east coast of Venezuela has also petroleum wells. A large pitch-lake supplies *asphalt* which is used for street paving. Cacao is the most valuable cultivated product.

COLOMBIA

The people of Colombia live mostly in the valleys of the Cauca and the Magdalena and on the high plateau. Coffee, cacao, cotton, sugar and tobacco are grown. Bananas are exported from the Caribbean coast. The llanos produce hides and skins and the forests rubber. Gold, silver, emeralds and platinum are mined, the chief mining centre being *Madellin*. *Bogota* (200,000) the capital, stands on a high plateau over 8000 ft. above sea-level.

ECUADOR

Ecuador is on the Equator, hence its name. 75 per cent of the people are Indians. *Cacao* is grown on the coastal plains and *coffee* on the cooler highland slopes. Cocoa, ivory-nuts (the hard substance found in the nuts are used for making buttons) and coffee are the leading exports. The manufacture of '*Panama*' hats is extensively carried on. These hats are woven from fibre obtained from the leaves of a palm-like tree and form one of the principal exports. *Quito*, the capital, is situated on the equator at an elevation of over 9,000 feet. It is said to have eternal spring. It has less than 100,000 inhabitants, and is connected wiih *Port Guayaquil* by a railway.

PERU

Peru was the empire of the Incas until the Spaniards came in search of treasure and brought ruin to it. It has three distinct regions like the other Andean States: (1) the hot coastlands which have little or no rain; (2) the cool plateaus, and (3) the hot, wet forests of the eastern slopes of the Andes and the adjoining plains. Sugar, rice and cotton are grown on the irrigated valleys of the many streams flowing from the Andes. Wool of the sheep, the llama and the alpaca and metals are the products of the plateau. In the *Montana* and in the forests of the Amazon lowlands, rubber, cocoa leaves, and the bark of the cinchona tree ('*Peruvian bark*') are collected. *Lima*, the capital, is seven miles inland with a population of less than 200,000, and is connected by railway with its port *Callao*.

BOLIVIA

Bolivia consists of a plateau and the Montana and Amazon forests. The occupations on the plateau resemble those of the Peru plateau *i.e.*, keeping herds of sheep, llamas and alpacas. The chief wealth of Bolivia lies in its minerals—silver, copper and tin, the last forming 65 per cent of the total exports. Mining is in an undeveloped state. Why? From the forests rubber and cinchona are sent down the Madeira River and on the plains cattle-rearing is important. Bolivia has no seaboard and its products are sent through adjacent countries. *La Paz*, the capital with a population of over 100,000 people, is built in a sheltered hollow in the plateau at a height of over 12,000 ft., above sea-level. Its connection by railway with the towns on the Pacific coast has already been referred to.

PARAGUAY

Paraguay, the least populated of the South American republics, has no seaboard like Bolivia. Which rivers form its frontiers? Paraguay is largely forested, but its eastern portion contains grasslands. Two of the chief products of Paraguay are *oranges* which grow wild, and *yerba mate* or Paraguay tea. Annually over 30,000 tons of oranges are exported. The collection of mate leaves from wild trees together with the preparation of the raw leaf for the market has been, for many years past, a leading industry in this country. Mate tea is the beverage of nearly 20 million people in South America. Cattle-rearing is also an important occupation. The chief exports are meat, hides, tallow, mate and oranges. The capital, *Asuncion*, is a river port on the Paraguay, and is connected by railway with Monte Video and Buenos Aires.

EXERCISES

(1) What natural drawbacks are there for the development of the Amazon basin?

(2) Explain why rubber is not such an important product of the Amazon basin as it was some 20 years ago?

(3) Draw a map of Brazil, marking clearly (i) the Selvas, (ii) the Campos, (iii) the areas where coffee, cotton and sugar are planted. Mark and name the chief ports.

(4) What industries are carried on in Brazil, and what facilities are there for carrying on such industries?

(5) What is each of the following and how is it useful: cinchona, coca, mandioca, yerba mate?

(6) Explain how the soil and climate of Sao Paulo are suited to the growth of coffee.

THE THREE SOUTHERN CONTINENTS:

REVISION

Now we shall consider the three Southern Continents together.

They are simple in build and their coastlines are not very much broken.

How do they lie with reference to the Equator and the tropics? Australia lies entirely in the southern hemisphere with the Tropic of Capricorn almost bisecting it; Africa lies on both sides of the Equator which runs through its middle; South America has the Equator passing through its northern part, and it extends much farther south than the other two continents.

All the three continents have great oceans to their east and west. Australia is an island: Africa and South America have been made islands by the cutting of the Suez Canal and the Panama Canal respectively.

All the three contain plateaus which once formed part an ancient continent, known as the *Gondwanaland.* The Western Plateau of Australia, the greater part of Africa (including Madagascar) and the Guiana and Brazilian Highlands are remnants of this ancient land mass. Africa is the only continent which has no broad plains.

Africa and South America have many large rivers while Australia has only a single river system. South American rivers are better fitted for navigation than African rivers. Why?

In all the three continents there are large areas in the same latitudes, especially south of the equator. These areas resemble one another in climate, vegetation and occupation. The following table shows the resemblance in climates and vegetation of the corresponding areas of the three continents ;

Climate	Vegetation	Australia	Africa	South America
1. Hot, dry summer; warm, wet winter	Grain & fruits	...	Mediterranean coasts	...
2. Hot and dry	Desert	...	Sahara	...
3. Hot, wet summer	Savannah	...	Sudan	The Orinoco Basin (llanos)
4. Hot and wet throughout the year.	Tropical Forest	New Guinea	The Congo Basin	The Amazon Basin (selvas)
5. Hot, wet summer	Savannah	South of the coastal forest	The Zambesi Basin	Brazil south of the Amazon forest (campos)
6. Hot and dry	Desert	Desert of Australia	Kalahari	Atacama
7. Hot, dry summer ; warm, wet winter	Grain & fruits	S.W. Corner & portion of S. Aust. & Victoria.	S.W. Cape Province	Middle Chile
8. Equable and wet	Temp. forest	Tasmania	...	South Chile

Besides these there are other areas : the monsoon hot wet forests of Colombia are like those of the Guninea coast and northern Australia ; the hot wet shorelands of Queensland and Mozambique are like those behind Rio de Janeiro. Temperate grasslands are represented by the *pampas* of South America, the *veld* of South Africa and the grasslands and downs of the Murray-Darling basin in South-east Australia.

In the same natural regions the same kinds of products are raised in all three, *e.g.*, rubber and cocoa in the forests, sugar, coffee, cocoa, cotton and bananas on the plantations, fruits and grains in the '*Mediterranean*' areas. Stock-rearing and grain-growing are the chief occupations of the people living on the great grasslands, there being more cattle than sheep on the tropical grasslands and more sheep than cattle on the temperate grasslands. Thus we see that the life of man is closely related to the physical features, the climate and the natural resources of the region in which he lives.

In all the three continents the original inhabitants were primitive savages. The Amazon Indians, the Pygmies of the Congo Forest and the Australian "*black fellows*" represent such primitive races. The great majority of the native races of these continents are being governed by Europeans who have attained a high civilisation. Much of the present development of these continents is due to the enterprise of these Europeans. But "two of them—Africa and South America were once homes of ancient civilisations, evidence of which is shown in the monuments, temples and ruined cities of Peru and Egypt."

The three continents are sparsely peopled so that there is room for many more people. All of them are very rich in minerals, and their farms, fields and forests have vast natural resources. They can produce much more food and raw materials than they do at present. Hence these continents can be said to be "new" and their further improvements will depend upon better means of communication and an increase of population.

EXERCISES

(1) Compare and contrast the three Southern Continents as regards their relief.
(2) Contrast South America and Africa as regards facility for internal communications.
(3) With reference to the Southern Continents name (a) 'Monsoon' regions, (b) 'Mediterranean' regions, (c) Deserts, (d) Temperate grasslands.
(4) Illustrate with reference to the Southern Continents that man's life depends upon his environments.
(5) Give as many instances as you can to show that modern scientific man has conquered nature.
(6) Draw a map showing the three Southern Continents and mark therein (a) the prevailing winds (b) the ocean currents (c) the natural vegetation and (d) the chief coastal towns.

THE END

NORTH AMERICA

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NORTH AMERICA

CHAPTER I

SHAPE, SIZE, POSITION AND COAST-LINE

NORTH AMERICA is the larger portion of what is called "the new world". You have already learnt in connection with South America why the two continents form the new world and how the name America was given to them. The Americas are "new" to-day in the sense that they are *young;* i.e., their resources have not been developed to their fullest extent. There are still large areas which await development and every year thousands of Europeans go to seek their fortune in the two continents.

NORTH AMERICA CONTRASTED WITH SOUTH AMERICA

But we shall see that North America is far in advance of South America in civilisation and economic development. This is due to several causes :

(1) The broad fertile plains of North America are more easily accessible than those of South America with the exception of the Argentine.

(2) The passes across the mountains of North America are not so insurmountable as those of South America.

(3) There are large deposits of coal and iron in North America, while very little of these is available in South America.

(4) The coast line of North America is very much broken with river estuaries and excellent harbours, while there are few good harbours along the firmly-drawn coast-line of South America.

(5) The climate over the greater part of North America is temperate and, therefore, suitable to European settlement and to great enterprises, while that over the greater part of South America is tropical and enervating, and therefore does not induce men to work.

(6) In South America the first European settlers were Spanish and Portuguese who were bent more on conquest than on colonisation. They married the natives and produced a race of 'half-breeds' that lack industry and foresight. But the earliest settlers in the eastern coast-lands of North America were English, Dutch and French, especially the first two who settled down and lived upon the land they had occupied. They did not marry the Indians and, therefore, their stocks remained pure. The flourishing condition of Canada and the United States is due to the virility of these people and later arrivals from other European countries.

SHAPE AND SIZE

North America is roughly triangular in shape, and like South America, it is broad in the north and tapers to the south. The area of the continent is about 9 million square miles, which is two and a half times that of Europe and three times that of Australia.

POSITION

Look at any physical map of North America. In the north-west the shallow *Bering Strait* (about 50 miles broad) separates it from the land mass of Asia, and south of this the two continents recede from each other. Hence the Pacific Ocean which lies between the two is broad. To the east of North America lies the Atlantic Ocean which is much narrower than the Pacific. Hence North America is nearer to Europe than to the *densely-populated parts* of Asia. This is considered as "the most important geographical fact relating to the new world", for had North America been as nearer the densely-populated parts of Asia as it is to Europe, it might have been colonised by Asiatic races and an Asiatic, instead of a European, civilisation might have been imposed upon it. Find from your atlas what ocean washes the northern shores of the continent. In the south it is bounded by Central America and the Caribbean sea. The narrow isthmus of *Tehuantepec* forms the boundary between North and Central America.

Observe the position of North America with regard to its latitude and longitude. It extends from 10° to 70° north latitude beyond which the islands reach almost to the North Pole. The whole continent, with the exception of southern Mexico and Central America, lies outside the tropics, whilst the north coast-lands and the islands of the Arctic Ocean lie within the Arctic Circle. Hence the greater portion of the continent lies in the North Temperate Zone. Contrast with the Southern Continents. Find the greatest north to south distance of the continent in miles.

The continent has a great stretch in an east and west direction extending, about the 45th parallel of latitude, from 70° to 123° west longitude. Calcutate the width of the continent in miles.

Longitude and Time: Which meridian almost bisects the continent? How many hours behind Greenwich is this meridian? Which meridian bisects India? What is the distance in longitude between the middle parts of North America and India? What is the difference in time?

Time-Belts: You know that every place has its own sun-time. It will have its noon when the sun is at its highest point there. If every place in a country set its clock by its own sun-time, there would be hundreds of clock-times all over the country. This would be most inconvenient, and railway time-tables would be confused and very difficult to follow. Hence the whole of a country has to observe one clock-time, and this is called *standard time*. The standard time in India is fixed by the 82½° E. meridian, and it is 5 hrs. 30 min. in advance of Greenwich time.

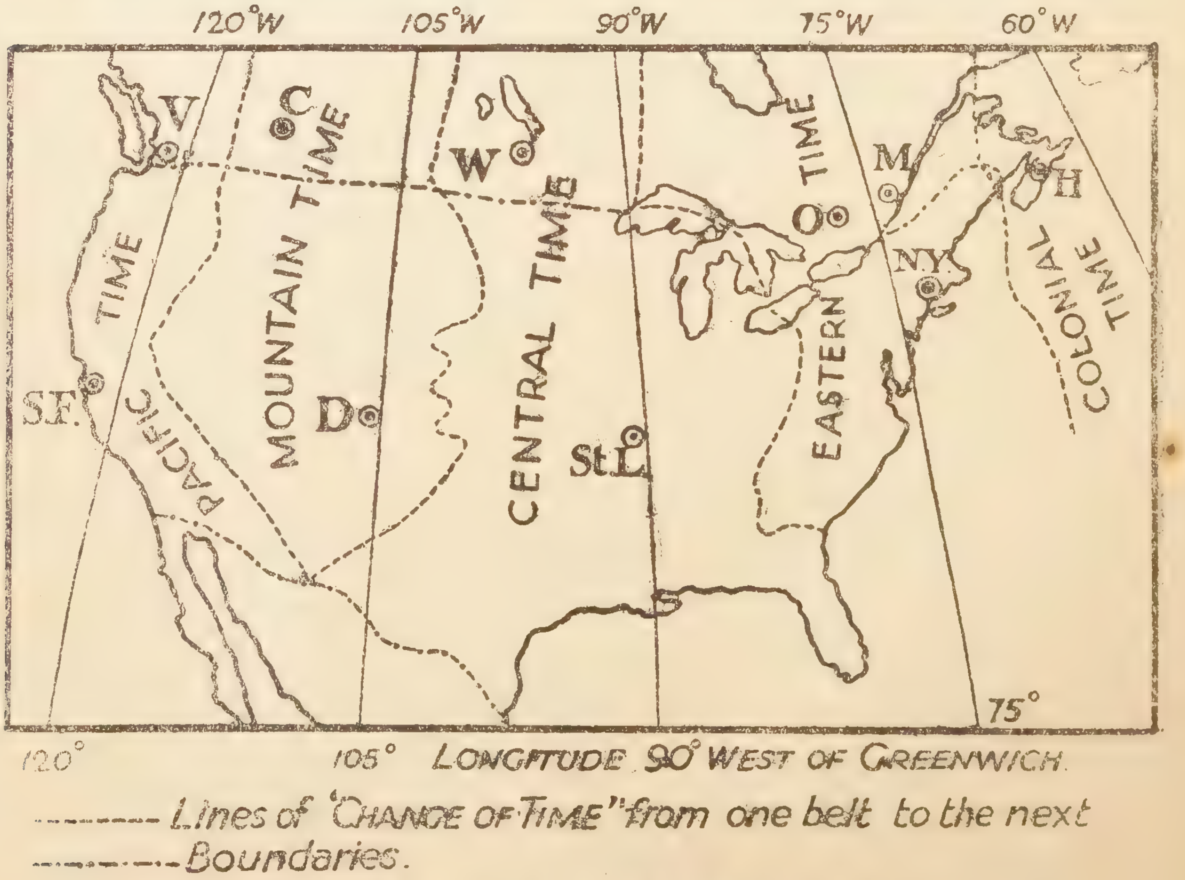


FIG. 1 Time Belts of Canada and the United States.

In North America it would be very inconvenient to have only one standard time, on account of the breadth of the continent. The United States has four "time-belts" and Canada has one more. Fig. 1 gives the name by which each belt is known. Each belt is 15° broad, and takes its time from the central meridian, the several central meridians being 60°, 75°, 90°, 105° and 120° west of Greenwich. Find the time in each belt when it is noon at Greenwich. Note from the figure that the boundaries of the time-belts are not however regular, for the railways have chosen the most convenient points on their systems to make the necessary change in time. Newfoundland has its own time.

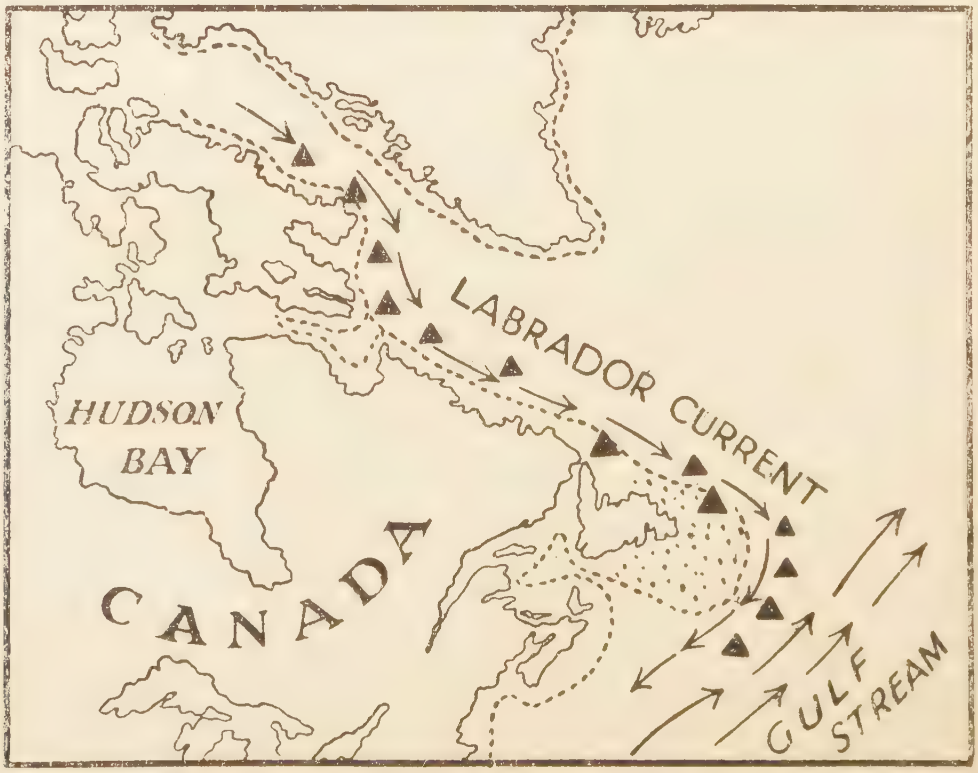
The standard time of Australia is fixed by the meridians 120°, 142½° and 150° east of Greenwich.

COAST-LINE

North America has a greater length of coast-line than South America or Africa, the total length being nearly 25,000 miles. It has one mile of coast-line to every 322 square miles of area. The mountain ridges and plateaus near the Atlantic coast do not follow the general trend of the coast-line, but run obliquely or at right angles to it, while those on the Pacific coast run parallel to, and follow closely, the general trend of the coast-line. The Atlantic coast is broken with deep, broad-mouthed inlets formed by the drowning of ancient river valleys, while the Pacific coast is more or less iron-bound. The *fiorded* coasts of British Columbia are due to coastal subsidences and the fringing islands are the higher portions of submerged mountain ranges. Compare the coast of South Chile.

North America has undergone up and down movements, greatest at the north and decreasing southward. To the north of the latitude of the north shore of the Gulf of Mexico the resultant of these movements is downward, the amount of the depression increasing with the increase in latitude on both the Atlantic and Pacific coasts. The *Chesapeake* and *Delaware Bays*, the *Estuaries of the Hudson* and the *St. Lawrence* on the *Atlantic coast*, the *Hudson Bay* in the *north*, the *deep fiords* of the *Canadian and Alaskan coasts* and *the mouths* of the *Columbia* and the *Sacramento* (*the Golden Gate*) on the *Pacifiic coast* are all due to this downward movement. The most important effect of these changes is the formation of numerous fine harbours and the extention of estuaries far inland, thus favouring commerce and fisheries in a high degree. The absence of good harbours along the coast of the Southern States is due to the *rising* of the land out of the sea.

The subsidence of the coastal margin of a continent gives rise to the *Continental Shelf*. Look at a good physical map of North America. You will find that the continental shelf near the Atlantic coast is broader than that



.......100 FATHOM LINE; ▲▲▲ ICE BERGS;
⁘ GRAND BANKS.

FIG. 2 The Grand Banks of Newfoundland.

on the Pacific side. South-east of Newfoundland, the continental shelf has an irregular surface marked by shoals and depressions, and furnishes the most valuable fishing-banks in the world (Fig 2). The 100-fathom line there is over 500 miles from the coast. This is the broadest portion of the continental shelf now known on the Atlantic border. The banks or shoals in the sea off the Newfoundland coast are also due to the additions of material brought by large floating masses of ice called *icebergs*. These bergs are derived from *glaciers*, especially in Greenland. They carry with them rock masses, mud, etc., derived from the land over which the glaciers flowed. They float down the cold Labrador current, and, when they reach the continental shelf near Newfoundland, they come in contact with the warm waters of the *Gulf Stream* and melt. The materials carried by them are deposited on the continental shelf.

You have already learnt that the Bering Strait is shallow. A rise of the bottom of less than 200 feet in the strait would bring about a land connection between Asia and North America.

All about the margin of the continent there are numerous islands rising from the continental shelf. Name the islands in the gulf of St. Lawrence. What is the name of the largest island near the west coast of British Columbia? The larger of the West Indies are also continental islands, but they have been long separated from the main mass of the continent. Typical examples of oceanic islands are furnished by the Bermudas which are composed of coral.

The northern shore of the Gulf of Mexico and the southern Atlantic shore of the United States have many lagoons formed by long narrow sand-bars thrown up by the sea.

EXERCISES

(1) Explain: "The two Americas are young."

(2) In what respects does N. America form a contrast to S. America ?

(3) Which is considered by the Americans as "the most important geographical fact relating to the New World" ? Why?

(4) Estimate the greatest length and the greatest breadth of North America.

(5) What is meant by "Standard Time"? Why should each country have a standard time ? Which meridian time is the standard time for India ?

(6) How many time-belts are there in U. S. A ? What time is it in each of the belts when it is 12 noon at Greenwich ?

(7) Name (i) the most important island on the west coast, (ii) the largest island in the West Indies, and (iii) the island shown on the map which does not form part of North America.

(8) What difference do you note between the Pacific and the Atlantic coasts ?

(9) Why are there so many islands, peninsulas, bays and harbours along the east coast of U. S. A.?

(10) Where is the continental shelf of North America broadest ? What is the importance of this place ?

(11) What are 'icebergs' ? How far do they help to form the 'banks' of Newfoundland ?

(12) What peculiar feature do you find along the Gulf coast and the Southern Atlantic coast ? What is this due to ?

CHAPTER II

RELIEF

Study Fig 3. which shows the structural divisions of North America. Like South America, North America also can be divided into three physical divisions. They are (1) *The Western Cordilleras*, (2) The *Eastern Highlands*, and (3) *The Great Central Plains*.

I. The Western Cordilleras : These extend from the Arctic Ocean to south Central Mexico and form the back-bone of the continent. They reach their maximum breadth of 1000 miles in about 40° North Latitude. They are much younger than the Eastern High-lands, and are the result of a mighty upheaval. The process of up-lift is not yet complete, for earth-quakes are frequent and volcanoes occur scattered throughout the system.

The Cordilleras consist of (*a*) *the Rockies*, (*b*) *the Pacific Ranges*—the western high ranges, and (*c*) *the intermont plateaus and basins* (Fig 3).

(*a*) **The Rockies** are a series of parallel ranges broken here and there by river gaps through which the great trans-continental railways pass. The highest peaks, which are all above 14,000 ft., are in the United States. *Lincoln, Harvard* and *Pike's Peak* are some of them. Traces of volcanic activity still remain in the wonderful *geysers* or hot springs (Fig 4) of the *Yellowstone Park.* In Mexico the range is known as the *Sierra Madre.*

The Yellowstone National Park lies in the Rocky

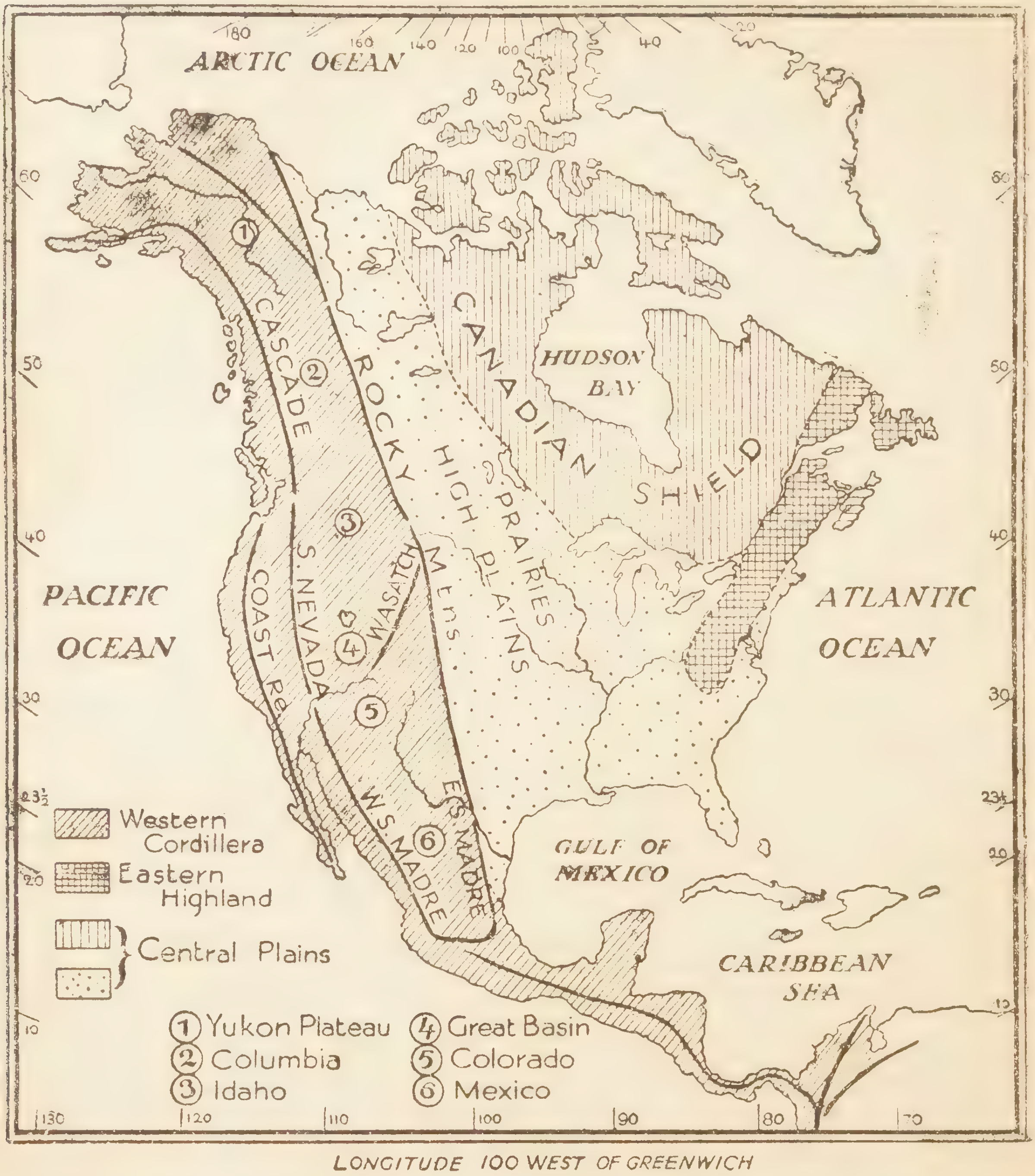


FIG. 3. The Chief Physical Divisions of North America.

I. Folded Mountains, Plateaus and Volcanoes.

II. Residual Mountains. III. (1) Ancient Peneplain.

III. (2) Lowlands of Sedimentary Rocks.

The dotted line marks the southern limit reached by ice sheets.

mountains in the north-west corner of the state of Wyoming. It is one of the most wonderful regions in the world and contains hot springs, boiling mud springs, gey-

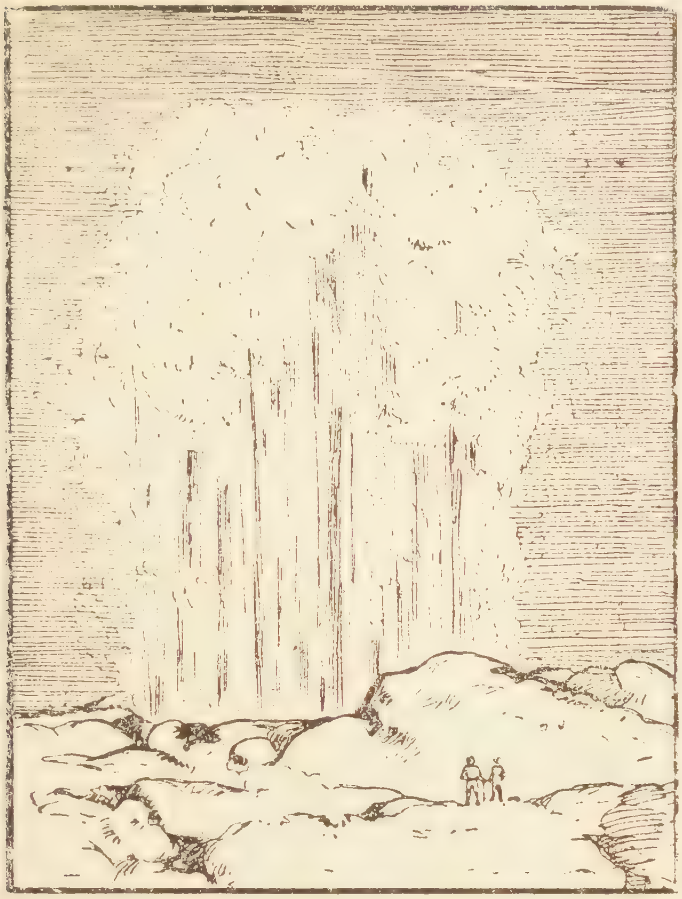


FIG. 4. A Geyser.

sers and canyons (deep gorges worn by water courses), besides beautiful lakes, water-falls, and magnificent forests. One famous geyser is called "*Old Faithful*", because it shoots with great regularity, every 63 minutes, a great column of water to a height of from 120 to 150 feet.

(*b*) **The Pacific Ranges** lie in two parallel series; the westernmost of these is the *Coast Range* of California broken midway by the Golden Gate. This is continued northward in the partly-submerged range whose peaks form the islands fringing the fiorded coast of British Columbia. In the south it runs through the peninsula of Lower California. The other ranges can be traced through the *Sierra Nevada* (*Mt. Whitney*, 15,000 ft.); the *Cascade Range* (*Shasta*, 14.000 ft.) cut in two places by the *Columbia* and the *Fraser*; and the *Alaskan Range* which contains the highest peaks of North America (*Mc Kinley*, 20,300 ft.; *Logan* 19,500 ft.; *St Elias*, 18,000 ft.). In Mexico these are known as the *Western Sierra Madre*.

The most famous of the valleys of the Sierra Nevada is the deep precipitous valley of the *Yosemite* which is 7 miles long with walls of rock from 3000 to 5000 ft. high. Between the Sierra Nevada and the Coast Range lies the rich valley of California drained by the *Sacramento* and *San Joaquin* rivers. This is part of the line of depression represented in Canada by the straits between the islands and the mainland and in Mexico by the Gulf of California.

(c) **The Plateaus and Basins** : The great plateaus and basins lie between the high eastern and western ridges of the Cordilleras. There are six of these.

(1) **The Yukon Plateau,** rich in gold is drained by the Yukon river which flows to the Bering Strait.

(2) **The Plateau of British Columbia** has a very rough surface with the *Selkirks* and *Gold Range* running almost north and south. Between these ranges and the main range are deep valleys with rivers and chains of lakes.

(3) **The Idaho** or **Snake River Plateau** is covered by vast *sheets of lava** (4,000 feet thick) which have been dissected into deep canyons by the Snake River and its tributaries.

(4) **The Great Basin** : South of the Idaho plateau lies the Great Basin between the *Sierra Nevada* and the *Washatch* mountain. Its average elevation is from 4000 to 6000 ft. Hemmed in on almost every side, the "basin" has very little rainfall. Therefore, it is an area of inland drainage where salt lakes abound. The largest lake is the *Great Salt Lake.* In the south-western corner of the basin, near the Sierra Nevada is the *Death Valley* which is 480 feet below sea-level. Compare the basin of the Dead Sea.

(5) **Colorado Plateau:** This is a region built up of sediments of vast thickness and dissected by the wonderful canyons of the Colorado. The *Grand Canyon* of the Colorado in Arizona is one of the wonders of the

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*Lava is the molten rock that is discharged from a volcano and flows down its sides.

world. Here the river flows, for over 200 miles, at the bottom of a chasm over 6,000 feet in depth and varying in breadth from 10 to 12 miles.

(6) **The Mexican Plateau:** This is really a great lava-filled valley between the eastern and the western Sierra Madre, and is one of the richest mining regions of the world.

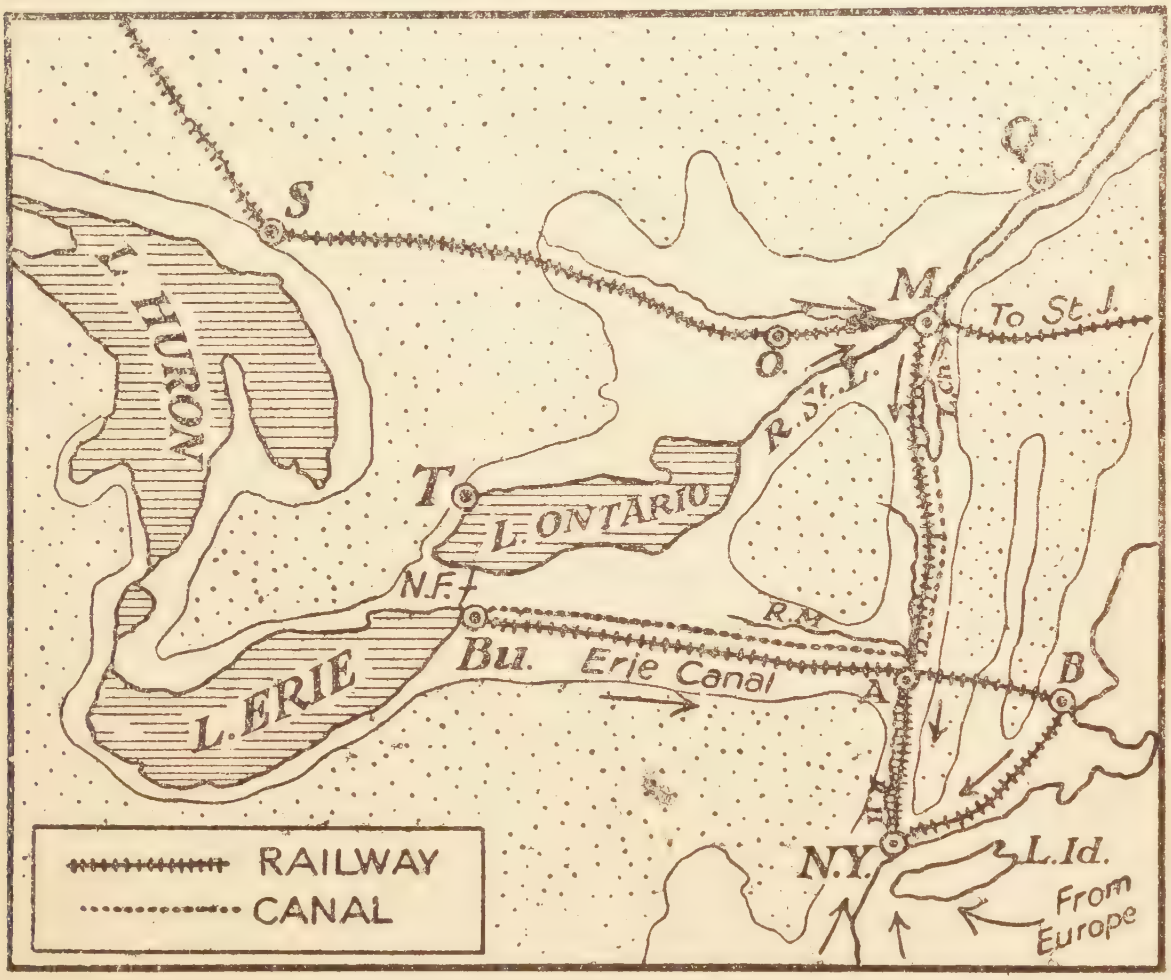

FIG. 5. The Hudson-Mohawk Gap.

This figure also illustrates the importance of the position of (a) New York and (b) Montreal. Land above 600 ft. is shaded.

II. The Eastern Highlands: These form the oldest part of North America except the "Canadian Shield" marked round the Hudson Bay in fig. 3. These include the *Laurentian Highlands* and the *Appalachian System*, The Laurentian Highlands occupy Eastern Labrador and along with Newfoundland, have been cut off from the Applachian system by the Gulf of St. Lawrence. These are composed of hard old rock which has been much worn down.

The Appalachian system extends from the Gulf of St. Lawrence to within 150 miles of the Gulf of Mexico in a north-east to south-west direction. It is cut into two by the deep rift-valley of the Hudson. North of the *Hudson-Mohawk Gap* (fig 5) lie the *New England Highlands* which are lower in elevation than the Southern Appalachians. The Hudson-Mohawk Gap provides an important route from New York to Buffalo on Lake Ontario. The Appalachians south of this gap consist of a number of parallel ranges flanked on either side by a plateau. These parallel ranges consist of hard rocks which have been left behind after the softer rocks of much higher folds have been removed by the action of water. Study fig. 6 which shows a diagrammatic section across the Eastern Highlands.

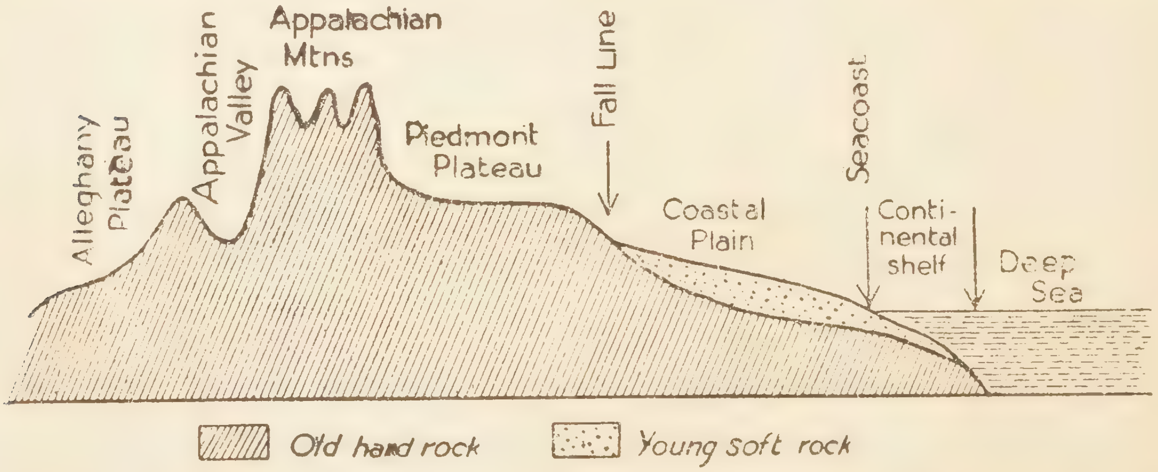

Fig.6. A diagrammatic section across the Eastern Highlands and the Coastal Plain.

You can recognise there (1) *Alleghany Plateau* in the west which rises gradually from the lowlands of the Mississippi basin, (2) the *Appalachian Valley* between the Alleghany plateau on the west and the parallel ridges of the Appalachians on the east, (3) the parallel ridges called the *Appalachian Mountains*, (4) the *Piedmont Plateau* east of the *Blue Ridge* (the highest of the parallel ridges), the highest point of which is *Mount Mitchell* (6,711 ft.), and (5) the *Coastal Plains* which are composed of newer and softer rocks. The Appalachians are cut through by deep water-gaps which provide easy routes for railways and roads from the Atlantic sea-board to the great plains in the interior. The *Delaware*, *Susquehanna* and *Potomac* water-gaps are typical.

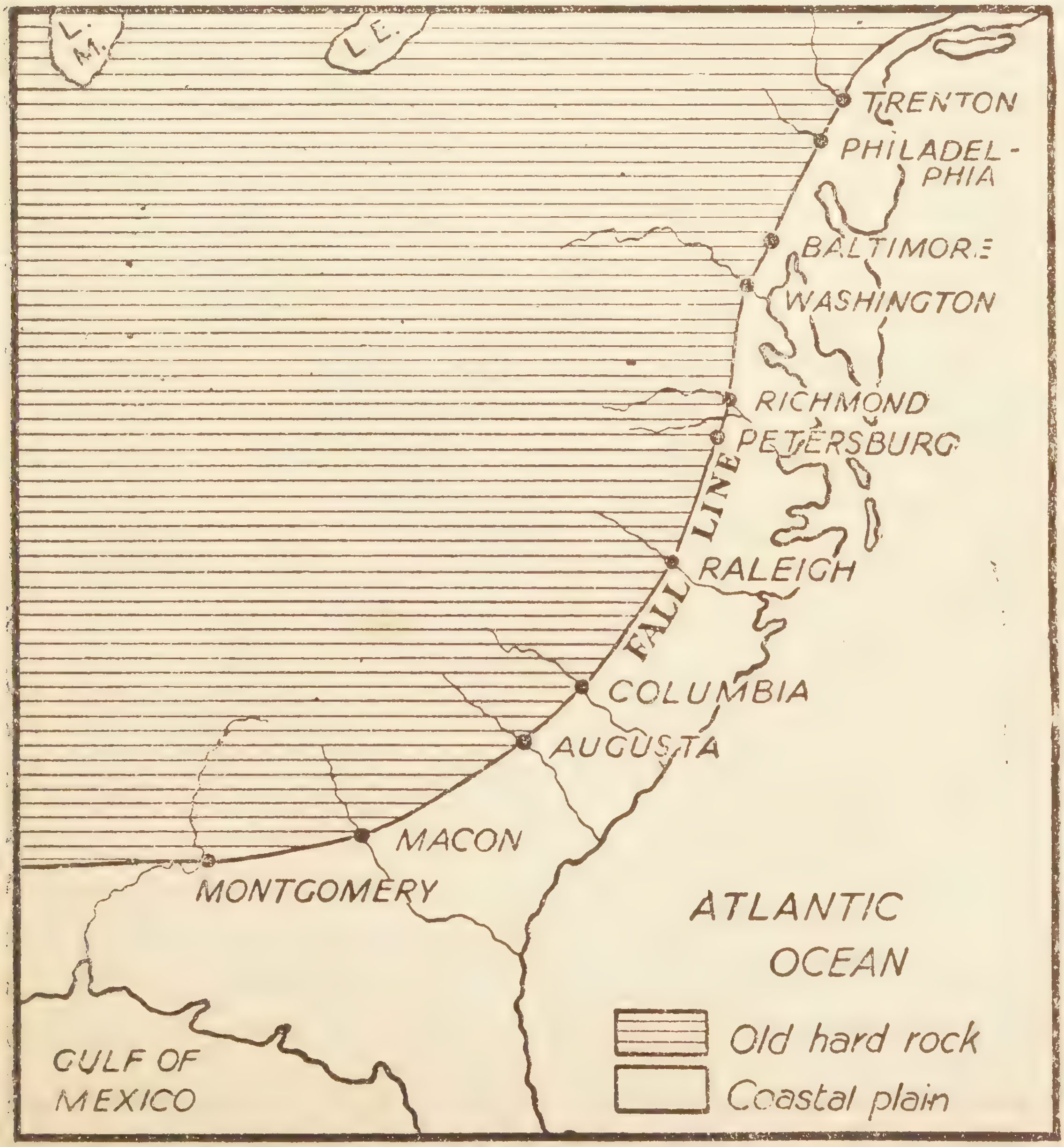

FIG. 7. The Fall Line.

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Where the Atlantic-flowing rivers pass from the hard old rocks of the plateau to the softer newer rocks of the coastal plain, falls occur. Fig. 7 shows the *"Fall Line"** and the cities that are situated on it. How are the falls advantageous to these cities? The Eastern Highlands are important because they contain the richest *coal* deposits.

III. The Great Plains lie between the Western Cordilleras and the Eastern Highlands and extend from the Arctic Coast to the Gulf of Mexico. They are composed of horizontal layers of sedimentary rocks except in the *Hudson Bay* region. This region is the oldest part of the continent and consists of hard crystalline rocks. The great mountain system which once arose there has been reduced, by age-long denudation, to a *peneplain*, that is almost a plain. Hence it is called the *Laurentian Peneplain.* It is also called the Laurentian or *Canadian Shield* (Fig. 3), because it is low in the centre 'like a shield lying on its back'. Round the rim of this shield is a chain of rivers and lakes; *eg.*, the *Mackenzie* system on the west and the *St. Lawrence* system on the south. Find out from your atlas the names of these lakes.

The *Mackenzie* drains the plains northwards into the Arctic Ocean, the *Nelson* into the Hudson Bay, the *St. Lawrence* eastwards into the Atlantic, and the *Mississippi* southwards into the Gulf of Mexico. Between the northern and southern plains there is a low divide—nowhere more than a thousand feet—known as the *Height of Land.* The low central portion of the plains is known as the *Prairie Plains*, which form a large part of the fertile cultivated regions of the north. The length of these natural meadows from north to south is nearly 2000 miles and their total area is about 500,000 square miles. On the north they merge with the *Sub-Arctic Forest Plains*, and on the south with the *Gulf Plains*. The Gulf Plains possess a rich soil well adapted for the cultivation of cotton, corn, sugar-cane and rice.

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* This line connects the falls on the rivers leaving the plateau for the coastal plain.

West of the Prairie Plains lie the *High Plains* which stretch along the foot of the Rockies from the Mackenzie to the Rio Grande. These plains (or plateaus) rise gradually from east to west and reach an elevation of 5,000 to 6,000 feet along their western margin. They have extensive grasslands and are therefore suitable for stock-rearing. But there are some parts of the High Plains which are unsuitable for this purpose. They are the *Bad Lands* of South Dakota. The land is bare and barren for want of water, but occasional rains have made countless deep channels; so it is difficult to cross and unfit for stock-rearing or agriculture.

The Atlantic Coastal Plain: This stretches from Nova Scotia to Florida, widening out towards the south. The level plain south of the Hudson has been formed by the uplift of portions of the continental shelf. The 'Fall Line' forms the boundary between the plateau and the plain. This is a fertile region and, therefore, supports a dense population. Along the coast of Florida there are coral islands.

The work of ice in North America: We have evidences to show that the north of North America was once buried beneath a great ice-sheet of enormous thickness. The dotted line in Fig. 3 shows the southern limit of this great ice-sheet. Deep lake basins like those of the St. Lawrence and rich deposits of glacial soil like that of Manitoba are due to the action of the ice-sheets. But much of New England has been rendered unfit for cultivation on account of the stony *debris* left behind.

The Relief of Central America and West Indies: We have seen that the Pacific Cordillera ends at the south in south-central Mexico. The highlands of the southern portion of Mexico, Central America and the West Indies present a great series of folds which trend in an east and west direction. Hence they form an exception to the mountains of North and South America. The name '*Antillean* mountains' has been given to those highlands. The West Indies are the outstanding portions of the ancient Antillean continent whose subsidence has resulted in the formation of the Caribbean sea or "the American Mediterranean."

EXERCISES

(1) Draw a map of North America showing the main physical divisions.

(2) Find from your atlas the names of the several gaps in the Rockies through which the great trans-continental railways pass.

(3) Mention the various parts that make up the Western Highland system.

(4) Locate the Yellowstone National Park, the Yosemite Valley, and the Death Valley.

(5) Which is called the 'Canadian Shield'? Why is it so called? What do you find round the rim of the shield?

(6) Explain the importance of (i) the Hudson-Mohawk gap and (ii) the "Fall Line". Draw sketch maps to illustrate your answer.

(7) What is meant by (i) the Height of Land (ii) the High Plains, and (iii) Bad Lands?

(8) Why is the Atlantic Coastal Plain south of the Hudson mouth very flat?

(9) Draw a section across North America about 45°N. lat., and name the various physical features.

(10) Give some instances of the work of 'ice' in North America.

CHAPTER III

RIVERS AND THEIR WORK

The rivers of North America can be classified according to the ocean into which they flow :—

(1) **Rivers flowing into the Arctic Ocean and Hudson Bay:** These are of little commercial importance as they flow into an ocean that is usually blocked with ice. For several months of the year they are frozen; however, the *Mackenzie* is navigable for the greater part of its course when it is not frozen. It has three great lakes in its course. Name them.

The only river of importance which flows into the Hudson Bay is the *Nelson.* This flows out of Lake Winnipeg into which flow the *Saskatchewan* from the west and the *Red River* from the south. Lake Winnipeg is only a remnant of a much larger lake formed by the great ice-sheet referred to in the previous chapter. The silt-laden bed of this ancient lake now forms the rich wheat lands of Manitoba and Red River valley.

(2) **Rivers flowing into the Atlantic:** The **St. Lawrence** is by far the most important of these rivers; for, with the Great Lakes, it forms a route into the very heart of the continent, and enters the ocean opposite the shores of Western Europe. The St. Lawrence with the five great lakes, *Superior*, *Michiegan*, *Huron*, *Erie* and *Ontario* provide an inland waterway for 2,000 miles. But it is ice-bound for about four months every year, and has various rapids and falls which have necessitated the cutting of

canals to enable sea-going vessels to reach Lake Superior. Between Lake Superior and Lake Huron are the rapids of the *St. Mary River* which are avoided by the "*Soo*" canals. There are three of these, two American and one Canadian, and these carry more than four times the tonnage of the Suez canal.

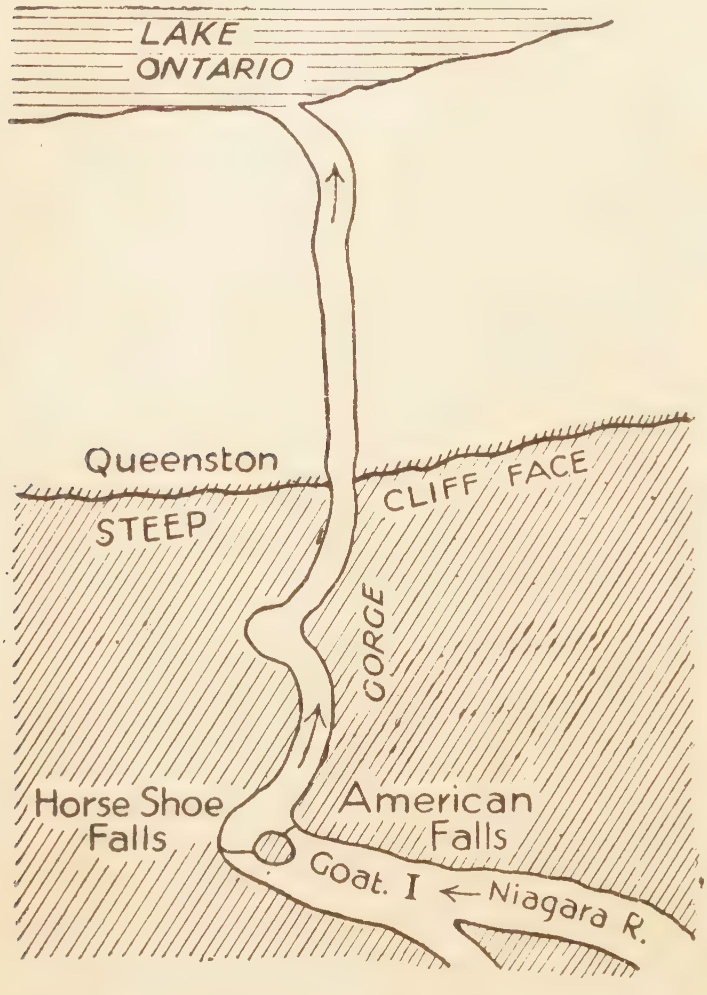


FIG. 8. Diagram showing Niagara Falls, Gorge and Cliff Face.
Land above 400 ft. is shaded.

Between Erie and Ontario are the great *Niagara Falls* to avoid which the *Welland Canal* has been constructed. The falls occur where the Niagara River leaps over a limestone ledge into a gorge 400 ft. deep and 7 miles long (Fig. 8). The Goat Island which over-hangs the Falls divides the *Canadian* or *Horse Shoe Fall* (158 ft. high and 3,000 ft. wide) from the *American Fall* (166 ft. high, 1060 ft. wide). The Falls are now used to create *electric power* which is supplied to distant cities like Buffalo. The falls first began over the edge of the steep cliff face (near Queenston) but have cut their way up-stream and made the seven-mile gorge. How they have done this is shown in Fig. 9. The top layer is limestone which is comparatively harder than the shale below. The softer layers below are more

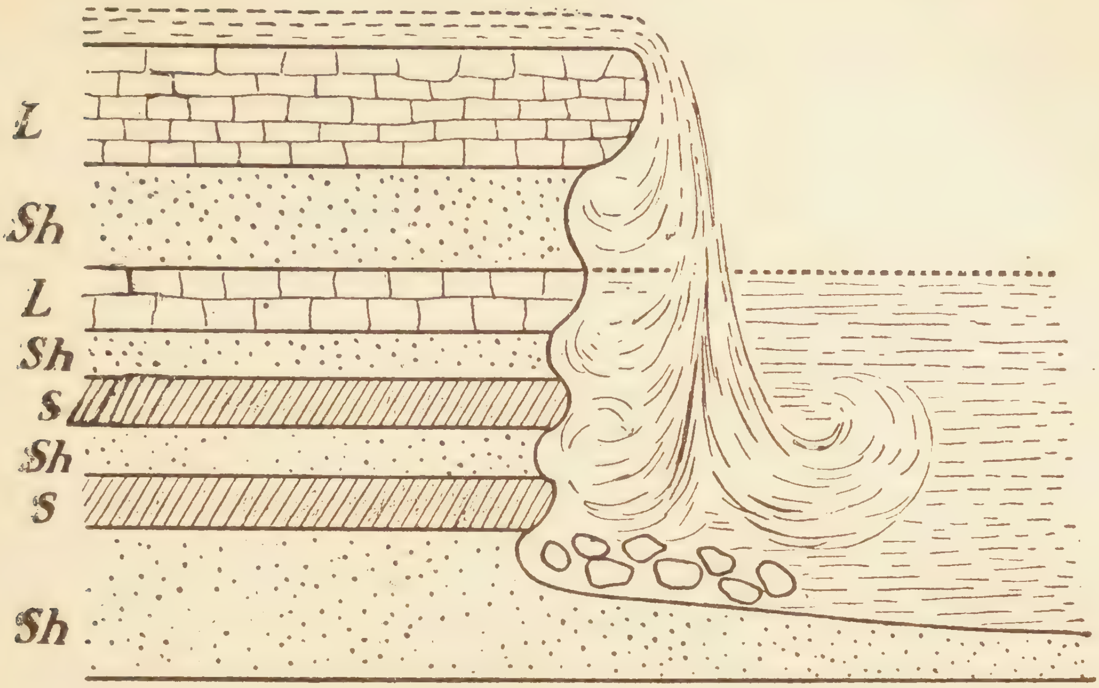


FIG. 9. Niagara Falls.
L (Limestone) & S (Sandstone) are hard rocks; Sh (shale) soft rocks
The falling water helped by stones eats away the softer layers of rock faster than the harder ones. Rock from the upper layer is always falling down. Hence the Falls are receding slowly.

easily worn than the harder ones above. The harder rocks fall as they get undercut and so the falls recede (at a rate which is estimated to be one foot every year).

Just above Montreal are the *Lachine Rapids* which provide power to the city and neighbouring factories. Canals have also been constructed to avoid these rapids; but they are not over 14 ft. in depth.

The St. Lawrence is connected by a small tributary, a lake and a canal with the *Hudson* (Fig. 5) which is also connected with the northern end of Lake Erie by means of the *Erie Canal* passing through the Mohawk valley (Fig. 5). New York owes its importance to its situation at the mouth of the Hudson.

The other rivers which flow directly into the Atlantic are important for two reasons : (i) they have falls where they leave the harder rocks of the plateau for the softer rocks of the coastal plain (Fig. 7), which furnish water power; (ii) their plain courses are broad and navigable and their drowned estuaries form excellent harbours. The lower courses of these rivers are tidal and towns have grown up at the tidal limit. Where this happens to be at the Fall Line, the towns enjoy a double advantage of site; *e. g.*, Philadelphia, Baltimore, Washington and Richmond.

The **Mississippi** ("*Father of Waters*") which flows into the Gulf of Mexico is one of the greatest rivers of the world. With its tributary the **Missouri** ("big muddy") it is 4,200 miles long, and drains a basin which is as big as India in extent. The total navigable waterways of the Mississippi basin exceed 10,000 miles; but its navigation has always been much impeded by shifting sand banks and channels, and by disastrous floods.

Let us learn something about the work of this mighty river. Its course can be divided into (*a*) the *upper course* from the source to St. Paul, (*b*) the *middle course* up to Cairo where it receives the Ohio, (*c*) the *lower course*. In fact, all big rivers may be so divided.

(*a*) *Upper Course or Torrent Track:* Rivers have their sources in springs, lakes or glaciers, and these are supplied by rain or snow. The Mississippi rises in a small lake in *Minnesota.* The slope of its bed is greatest and so the river flows fastest. Its speed enables it to move along loose stones which rub against its bed and deepen it. The sides of the channel are steeper here than in the middle course; masses of rock-fall into the river, and these are gradually broken up and swept down as pebbles which grow ever smoother until they are reduced to sand and silt. Thus the river sand is produced by the rubbing of pieces of stone one against another. Here, there are many waterfalls, the chief of which are the *Falls of St. Anthony* which give power to the milling industry of *Minneapolis.* (Compare the cotton mills at Papanasam, in the Tinnevelly District). The falls on the Fall Line and at Niagara are other examples. Water falls occur where streams flow over strata of different hardness. (Fig. 10)

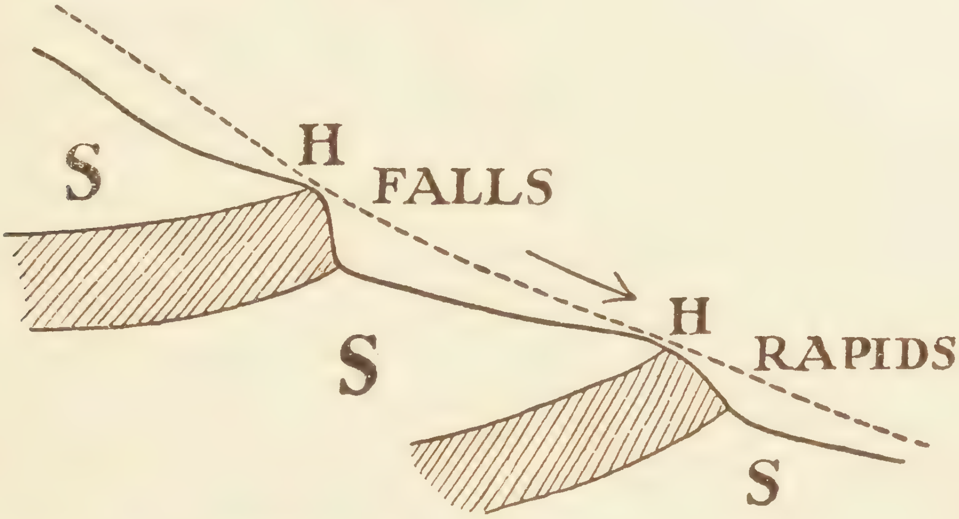


FIG. 10. Diagram to show where water-falls occur. Soft layers (S) are worn away more quickly than hard strata (H). Dotted line shows early stage of river course.

(*b*) *The Middle Course or Valley Track:* Here the slope is more gradual and the river flows more slowly; but its volume is greater because many tributaries add their water to its flood. The valley is widened, and as the current is slow, any obstacle is able to turn the river out of its course. So the river swings from side to side wearing, not only its bend, but also its banks. In this part of its course the river flows through a broad flood-plain bounded by low bluffs on which the towns are built. Since the current is not so swift here as in the upper course, much of the sediment brought by the Missouri and its tributaries has to be dropped to the bottom.

(*c*) *The Lower Course or Plain Track:* Here the current is usually slowest and the river is broadest. For

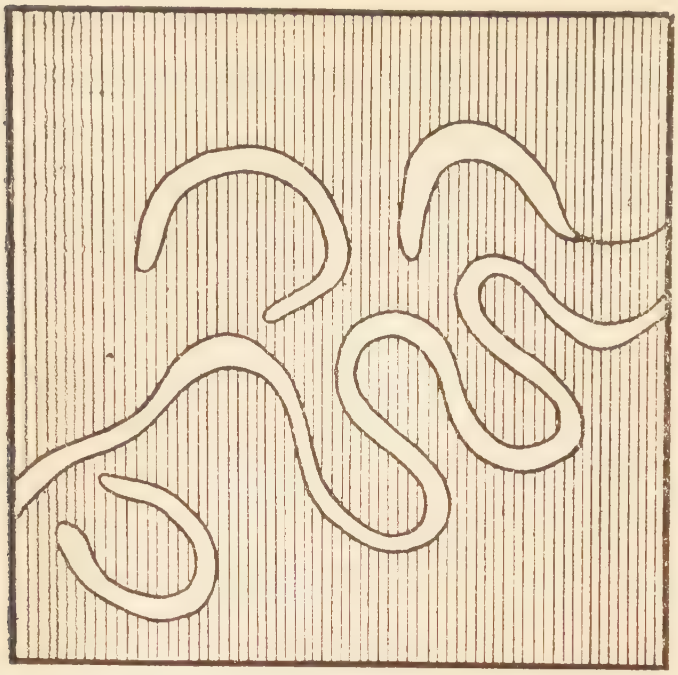


FIG. 11. Meanders and 'cut off' lakes.

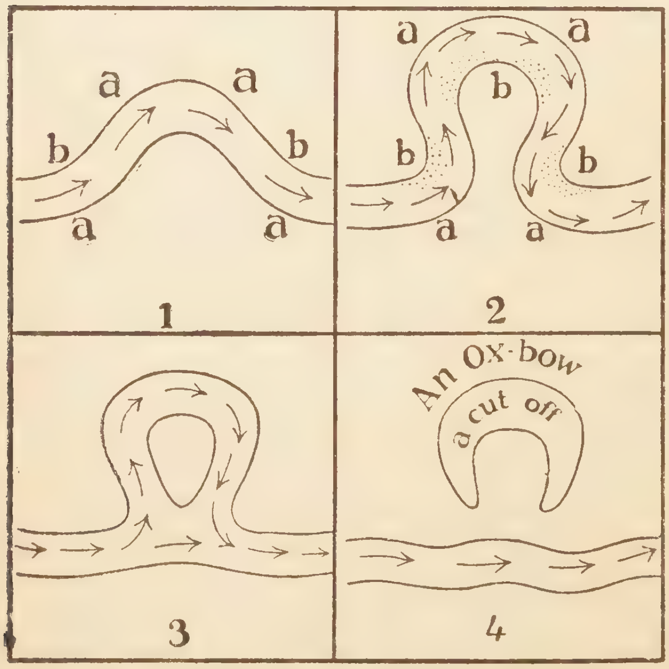


FIG. 12. Diagram showing the formation of a 'cut-off' lake.

a-outer side of the current where the current of river is swift and so the banks is cut back.

b-inner side of the current where current is slower and so sediment is deposited.

six hundred miles it flows over a flood plain varying in width from 20 to 75 miles. The river winds in swinging courses or *meanders* (Fig. 11) as it is easily turned aside by any slight obstacle. As it flows round the bends it wears away the outer banks, as at (*a*) in Fig. 12 (2) where the currrent is strong, and deposits the sediment near the inner bank as at (*b*) in the same figure, where the current is slower. After a time the loop becomes so large and its neck so narrow that the river is able to cut through and take a direct course as in Fig. 12 (3). The loop is left as a lake called a "*cut-off*" or an "*ox-bow*" lake as in Fig. 12 (4). Such curved lakes or "*cut-offs*" are numerous near the banks of the Lower Mississippi.

In this course so much sediment is deposited on the bed of the river that it is raised above the level of the surrounding land. Hence banks of earth called *levees* have to be raised to protect the country from disastrous floods. The river enters the Gulf of Mexico nearly a hundred and fifty miles below *New Orleans* through the many branches of its delta (Fig. 13).

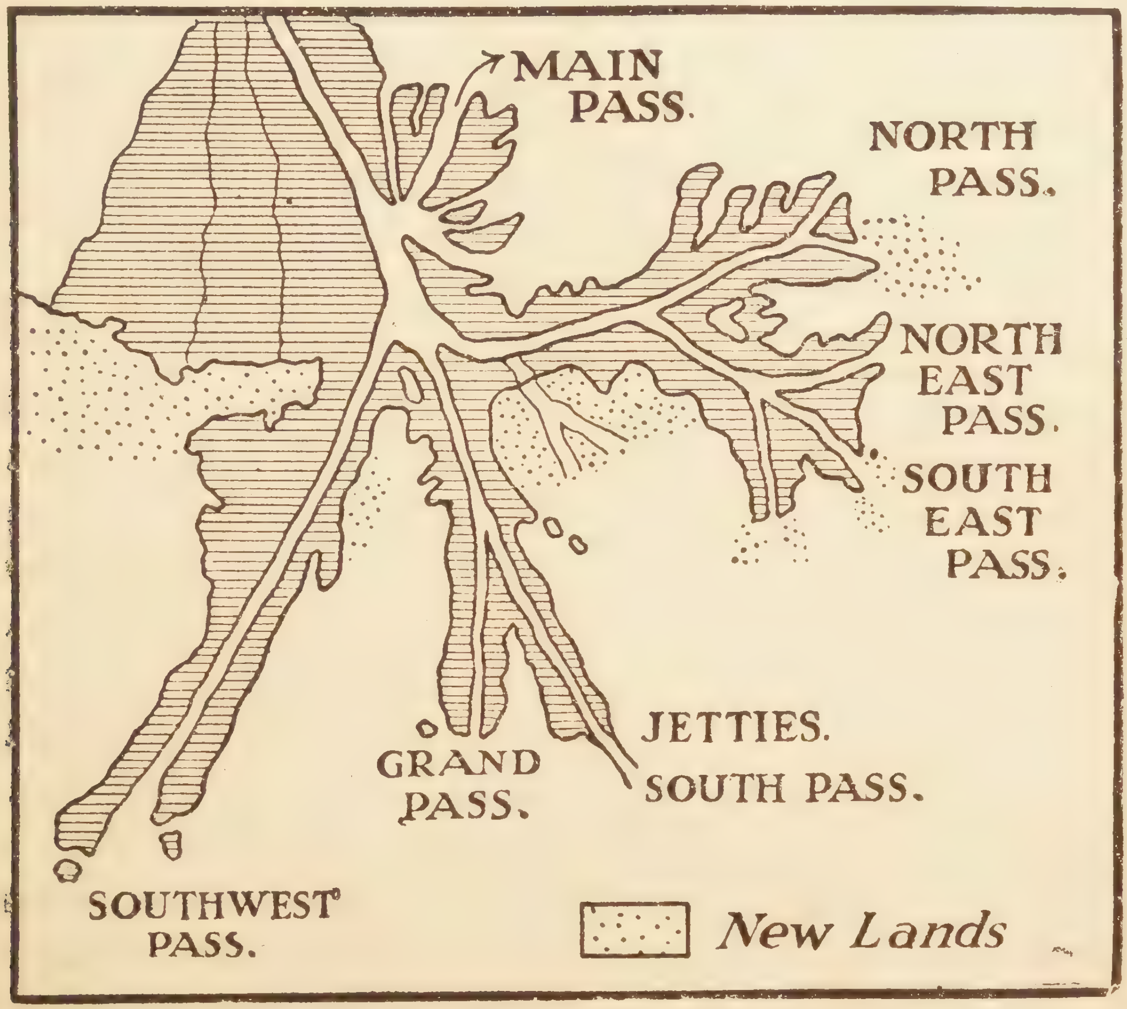


FIG. 13. The Delta of the Mississippi.
Notice the finger-like projections.

Every year the river is said to bring down more than 400 million tons of silt to the sea. A delta has been formed because the flow of the water is completely checked and there are no tides to sweep the deposit away. Note the finger-like projections. In what way is this delta different from that of the Nile or of the Ganges? The main arms are known as "passes" and are kept open by the jetty-like extensions. These jetties confine the river in a narrow channel so that the current becomes swift and is able to keep the passes open and deep enough for ships.

The Mississippi (2,490 miles) is navigable up to the "twin cities" of St. Paul and Minneapolis. *The Missouri* (2,900 miles) is navigable up to the foot of the Rockies for a distance of 4,000 miles from the Gulf of Mexico, but it is subject to floods.) The other tributaries on the right bank are the *Arkansas* and the *Red River*. The *Ohio*, the largest tributary on the left bank rises in the Alleghany Plateau and joins the Mississippi at Cairo. This river has more traffic than any other river of the basin, as it is the outlet for the great coalfields of Pennsylvania.

The *Rio Grande del Norte* which also flows into the Gulf of Mexico, forms the boundary between the United States and Mexico.

(3) **Rivers flowing into the Pacific :** Most of these are short and swift and flow through deep gorges. They are more useful for lumber transport than for navigation. The *Yukon* in the north is frozen for many months in the year, but it is used as the water-highway to the mining centres in summer. The most important river is the *Columbia* which is navigable up to the place where it breaks through the *Cascades*. It flows partly through British Columbia and partly through the United States. Its tributary, the *Snake*, cuts deep gorges or *canyons* through a plateau of lava. The *Fraser* which runs almost parallel to the Columbia flows entirely through British Columbia.

More wonderful than the canyons of the Snake are those of the *Colorado*. This river has cut through the Colorado Plateau a channel, nearly 500 miles in length, the bed of which is from 3,000 to 6,000 feet below the surface level. The deepest of the canyons is the Grand Canyon, 200 miles long and 6,000 ft. deep. The following conditions have favoured the formation of these canyons. Study Fig. 14.

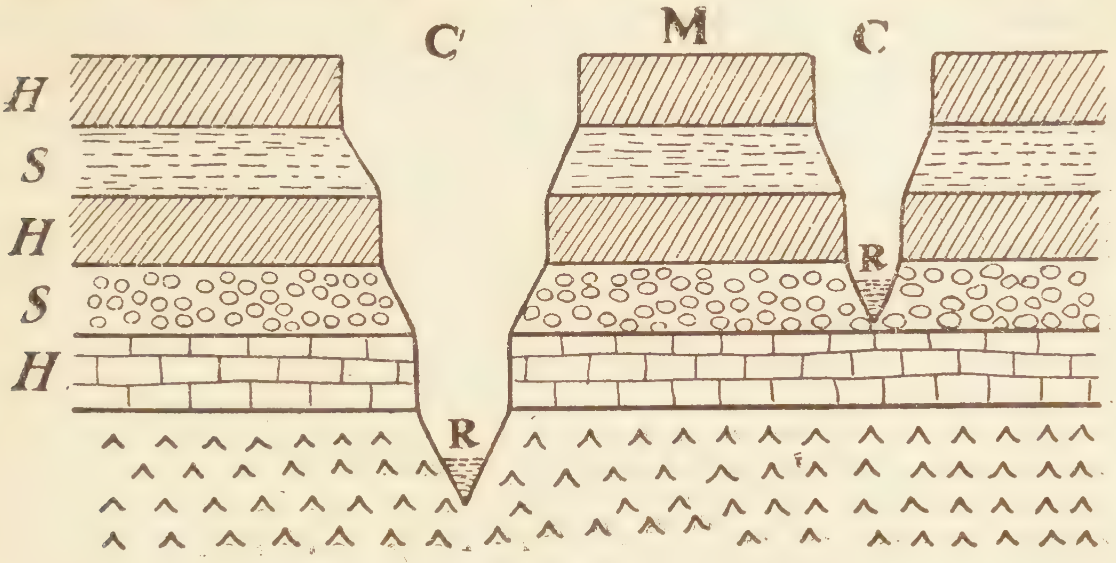


FIG. 14. Diagram showing the formation of a canyon in a plateau of horizontal strata arranged in alternate layers of relatively hard (H) & soft (S) rocks. R-river; C-canyon; M-mesa or flat-topped mountain.

(1) The layers of rock are nearly horizontal, and harder rocks alternate with softer ones. (2) There is a strong and rapid river supplied by snow and rain on the Rockies making its way downwards over the plateau. (3) The canyon region itself is arid so that there is no side-wash from the banks into the river by rain water, but there is only the saw-like downward cutting of the stream.

Where the plateau is composed of a uniform hard rock, the sides are almost vertical as in the Snake River plateau. In the Colorado canyons the soft layers form gentle slopes and the hard rocks stand out as cliffs. The lower part of the canyons is narrower, deeper and much steeper than the upper part, because the cutting power of the river was suddenly increased by the rising of the whole plateau. The varied colouring of the mighty walls of the canyons adds to the grandeur of the scene. These canyons render communication between the different parts of the plateau very difficult. They divide the plateau into flat-topped, deep-sided blocks of mountains, known as *mesas* (Spanish for table). The smaller flat-topped mountains are called *buttes*. In the lower course the Colorado passes through true desert lands.

Inland Drainage: The *Great Basin* is the only inland drainage area in North America. There are many streams which either dry up or flow into lakes of varying size. The largest river is the *Humboldt* (500 miles long) which flows into *L. Humboldt*. The largest lake is the Great Salt Lake which is a remnant of a former lake of much larger extent. The lakes of the basin are saline and vary in size according to the season.

Resemblances between North and South America as regards Structure and Drainage.

(1) *Shape:*—Both are triangular, broad in the north and tapering toward the south.

(2) *Structure:*—(*a*) In the west there is a great highland region of young fold-ranges and blocks. (*b*) In the east there is a highland region of ancient rocks. (*c*) In the centre there is a great plain stretching from north to south. But South America has a greater proportion of plain than North America.

(3) *Drainage:*—The Mackenzie of North America corresponds with the Magdalena in South America, the Saskatchewan-Nelson with the Orinoco, the St. Lawrence with the Amazon, and the Mississippi-Missouri with the Parana-Paraguay. South America has no lake system to compare with the Great Lakes of the St. Lawrence Basin. The Great Salt Lake of the Great Basin can, perhaps, be compared with Lake Titicaca in Bolivia.

(4) *Coastal features:*—Both the continents have a broad continental shelf along the east coast and a narrow shelf along the west coast. The fiord-coast and "skerry-

fence" of South Chile can be compared with those of British Columbia.

EXERCISES

(1) With reference to a river explain the following : (a) source, (b) bed, (c) basin, (d) valley.

(2) Explain, with reasons, the difference between the action of a river in its upper course and that in its middle and lower courses.

(3) Examine your local stream or one nearest to your town or village. Find out a bend and compare the rate of flow and the depth of the stream at both banks. Which bank is steeper ? Where is sediment being deposited ?

(4) How is an "ox-bow" lake formed ? Draw a diagram to illustrate your answer.

(5) Under what conditions is a river delta formed ? How does the Mississippi delta differ from that of the Nile ?

(6) What are the drawbacks to the navigation of the St. Lawrence? How have they been remedied ?

(7) "The Niagara Falls have cut their way upstream." Explain by means of a diagram how they have done this. In what way are the falls useful ?

(8) "The St. Lawrence offers many points of contrast with the Mississippi." Mention any four.

(9) What is the Grand Canyon ? Where is it ? How has it been formed ?

(10) What are the disadvantages of the North American rivers that flow to the north ?

(11) What are the special advantages of the east coastal rivers ?

(12) Compare the lakes of North America with those of Africa.

CHAPTER IV

CLIMATE

Temperature: We have read in Part I (*pp.* 10-11) that the temperature of any country depends on three important factors: (i) *latitude*, (ii) *altitude*, and (iii) *nearness to the sea.* It also depends upon (iv) *winds*, (v) *mountain direction*, and (vi) *ocean currents.* Let us see how far the temperature of North America is governed by all these factors.

(i) **Latitude:** North America extends from 10° to 70° N. Lat. So the temperature varies from the equatorial heat of South Mexico to the polar cold of the Arctic Islands; but the great bulk of the continent lies in temperate latitudes. Latitude governs climate by deciding the inclination of the sun's rays and also the length of day. The higher the latitude is, the lower is the temperature, because the sun's rays fall more and more obliquely. But the great length of day during summer in the high latitudes gives them a comparatively high temperature while the great length of night gives them a low temperature during winter. In June almost every part of the Dominion of Canada has more than sixteen hours' sunlight, and at the Arctic circle it is 24 hours. Hence in north-western Canada the summer temperature is sufficiently high (over 60° F.) so that crops can be ripened in a relatively short period. In the higher latitudes the range of temperature is higher than in the lower latitudes; *e.g.* Fort Churchill (on Hudson Bay), 79° F.; Vera Cruz (Mexico), 15° F.

(ii) **Altitude:** The effect of this is not shown on the temperature maps (Fig. 15), as the isotherms show only sea-level temperatures. But we can find out the actual temperature of an elevated place if we know its altitude. How? [*Eg.*, Pike's Peak (14,111 ft.): Jan., 2·4° F and July, 40° F.]

(iii) **Influence of the sea:** Look at the isothermal maps of January and July. January is typical of northern winter and July of summer. Over the continent the January isotherms bend southwards; over the adjacent ocean they bend northwards. This shows that land surfaces are colder than sea surfaces in the same latitude. Why? Nearly two-thirds of the continent has an average temperature below 32° F. Hot conditions prevail only in South Mexico. Look at the July map. The isotherms bend northwards over the land and land surfaces are much hotter than sea surfaces in the same latitude. The 32° F. isotherm appears only in Greenland. By far the hottest part of North America in July is the area including North Mexico and Colorado Plateau. The temperature is more than 90° F. and is comparable with that of the Sahara. Within the desert belt of Colorado a shade temperature of 120° has been recorded. Range of temperature increases with distance from the sea.

Compare the following towns:

Place.	Alt. in ft.	Mean Jan. Temp.	Mean July Temp.	Range.
St. John's (Newfoundland)	125	24° F.	60° F.	36° F.
Montreal	187	13° F.	69° F.	56° F.
Winnipeg	1492	-3° F.	66° F.	69° F.
Victoria (B.C.)	85	40° F.	61° F.	21° F.

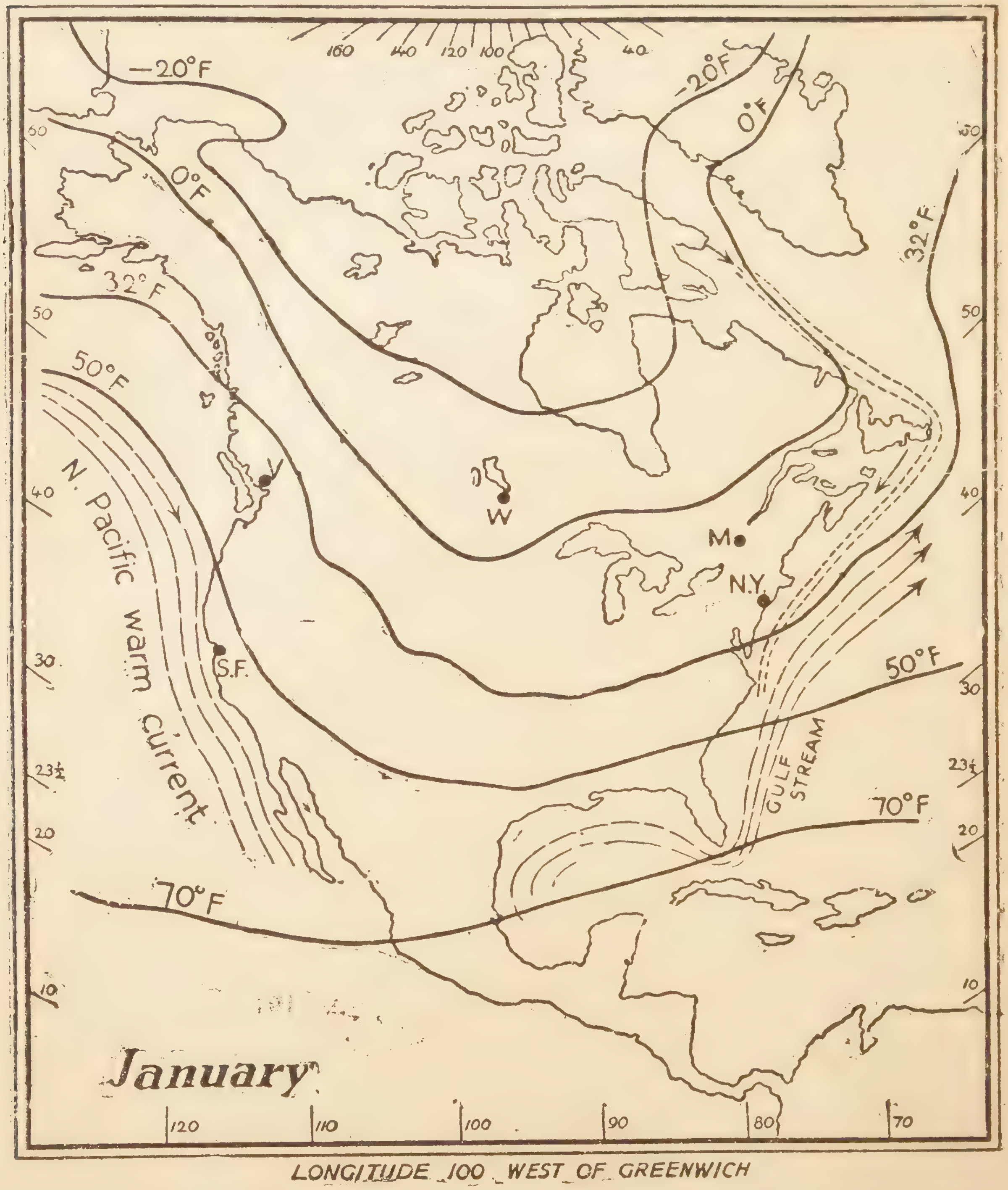


FIG. 15. Temperature-January Isotherms.

The greatest range of temperature is found in the Canadian North-west which is cut off from the oceanic winds from the west by the Pacific Cordilleras; *eg.*, Dawson city (1200 ft.): Jan., – 24° F.; July, 60° F.; Range, 84° F. A winter temperature of – 69° F. and a summer temperature of 89° F have been experienced by this city, so that it has

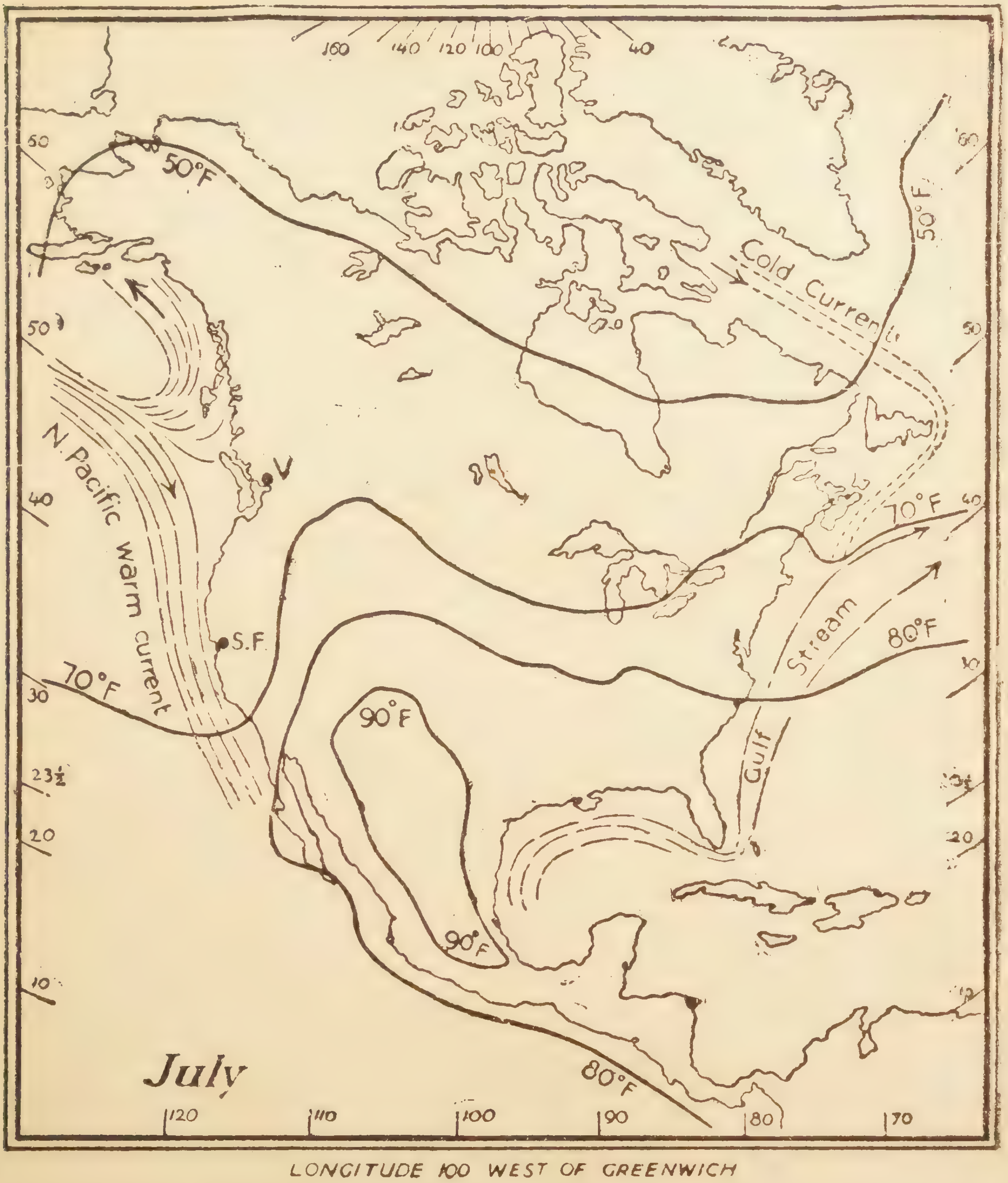


FIG. 16. Temperature-July Isotherms.

had an extreme range of 158° F. The least range of temperature is in the West Indies and the narrow isthmus of Central America. [*Eg.*, Kingston (Jamaica): Jan., 76° F.; July, 82° F.; Range, 6° F.

(iv) **Mountain direction and winds:** The prevailing winds of the northern part of North America are the "westerlies," and the mountains run north to south. Therefore the oceanic winds, as has already been said, are prevented from exercising their moderating influence upon the temperature of the interior. The absence of ranges lying from east to west across the central plains makes it possible for winds from the north or south to sweep over them unchecked, thus causing sudden changes of temperature. The winds from the north are cold and those from the south are warm. "Cold waves" from the north journey even to the coasts of the Gulf of Mexico. It is said that, "in December 1831, the Mississippi was frozen over for 130 miles below the mouth of the Ohio, and the ice at New Orleans was thick enough for skating." Very often the cold winds from the north known as the "blizzards" bury roads and railways with drifts of snow. Look again at the January isotherm map. Compare the temperature of the north-west and north-east coast-lands.

West coast	Jan. temp.	East coast.	Jan. temp.
Sitka (Alaska)	30° F.	Rain (Labrador)	7° F.
Victoria	40° F.	St. John's	24° F.

You at once see that the west coast is very much warmer than the east coast. The harbour of Vancouver is never frozen while Montreal cannot be reached on account of the freezing of the St. Lawrence. The westerlies are sea-winds on the west coast and therefore they are warm; but they are land-winds on the east. The difference in temperature between the west and east coast is also due to ocean currents,

(v) **Ocean Currents:** (Figs. 15 & 16). The coast of British Columbia is washed by a warm current while the east coast is washed by a cold current. The warm *North Pacific Drift*, a continuation of the Kuro Siwo current, meets the American coast in the neighbourhood of the mouth of the Columbia River and divides into two branches. One branch flows northward and makes the winters of British Columbia mild; the other, known as the *California Current,* flows southward as a cool current. This accounts for the low temperatures of the California coast. Look at the July map; the temperature rapidly rises from 60° F. on the coast to 90° F. on the plateau. Compare the July temperature of San Francisco (57° F.) and Sacramento (72° F.).

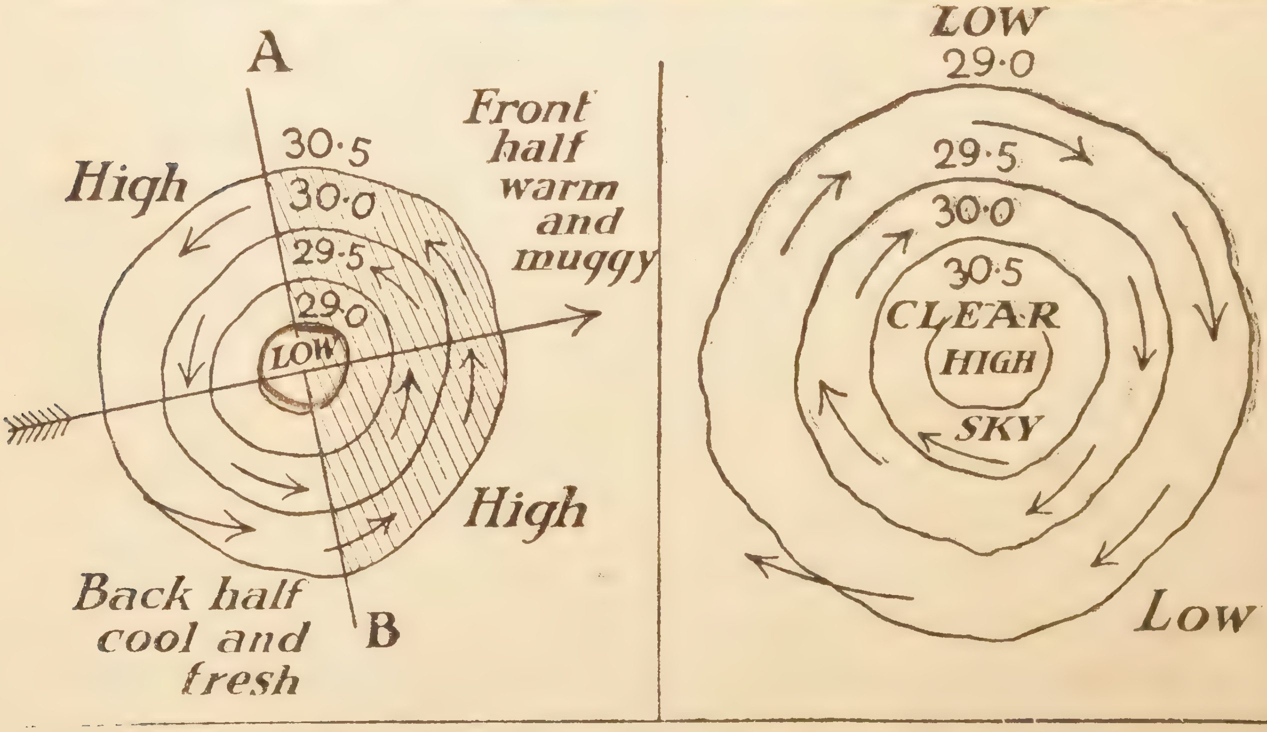
On the east coast the cold *Labrador Current* flows from Baffin Bay to Newfoundland and carries along great masses of ice (Fig. 2) which do not melt till they reach the warm Gulf Stream on the *Grand Banks* of Newfoundland. The very cool summer of Labrador is due to this current which cools the on-shore winds. The colder air from over the Labrador current meeting the warmer moisture-laden air from the Gulf Stream Drift produces fogs. The Labrador current can be traced far south as the "Cold Wall" close along the coast of the United States; but its climatic effect is not important as its width is very small.

The Gulf Stream is a current of very warm water which flows northward along the eastern shores of America from the south of Florida to Newfoundland. In summer the on-shore winds blow over it and become hot and moist. When the winds are intensely hot and moist, they are known as 'hot waves.' The continuation of the Gulf Stream or the Gulf Stream Drift flows across the North Atlantic towards the shores of north-west Europe.

PRESSURE, WINDS AND RAIN

Look at the rainfall maps (Figs. 18 and 19). You find a number of lines drawn on them. They are '*isobars*'* showing distribution of pressure as isotherms show distribution of temperature. They are lines drawn on maps linking up places having *the same barometric pressure for a given period.* The figures written close to the lines show inches, as pressure of air is measured in inches. Just as temperatures are reduced to sea-level, barometric readings are also *reduced to sea-level.* For every 900 feet in elevation the barometer falls 1 inch.

Cyclones and Anticyclones. Study Fig. 17 which shows (*a*) cyclonic and (*b*) anti-cyclonic conditions in the northern hemisphere. In a *cyclone* (Fig. 16-*a*) there is low-pressure in the centre, and the winds blow spirally



(a) A Cyclone. (b) An Anticyclone.

FIG. 17. Cyclonic and Anticyclonic conditions in the Northern Hemisphere. The long arrow in (a) shows the direction of a cyclone and AB divides the cyclonic system into two halves. The shaded half has steady rain and the unshaded has clearing up showers.

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* Greek; isos = equal ; baros = weight.

inwards towards the low-pressure centre in an *anticlockwise* direction in the northern hemisphere and in a *clockwise* direction in the southern hemisphere. An *anticyclone* (Fig. 16-*b*) is exactly the reverse of a cyclone. The wind blows spirally outward from a high-pressure centre. In the northern hemisphere it moves in a *clockwise* direction and in an *anticlockwise* direction in the southern hemisphere.

In a cyclone, the air which is blown into the centre is drawn upward. As it reaches the colder air above the moisture is condensed and falls as rain. Hence a cyclone *brings windy, wet, and stormy weather.* In an anticyclone, the air descends from the cooler layers above and spreads outward. Hence *dry conditions prevail.* A cyclone is *not stationary, but is moving gradually onward,* while an anticyclone *remains fixed for a considerable time.*

Tornadoes or *hurricanes* are produced when a cyclone covers a very small area and the difference in pressure between its centre and its margin is great. A cyclone may be 1000 miles across, but a tornado is less than 500 yards. "*A tornado is really a highly-concentrated cyclone.*" Tornadoes are most frequent in summer in the Mississippi valley and hurricanes in autumn in the West Indies and the Atlantic coastal plain. These winds do much damage to life and property.

Rainfall: Summer Conditions: (May—Oct.) Fig. 18 shows a low pressure area on the interior plateau in the south-west of the continent. This is due to the great temperature of the area in summer. (See July temperature map). High pressure or anticyclonic conditions lie over the north Atlantic and the north Pacific. There is a general *inflow of moist winds* from the sea and a large part of the continent, especially the eastern half gets rain.

In the east and south-east of the continent, southerly and south-westerly winds blow from the Gulf and the Atlantic, and give heavy rainfall; but the rainfall decreases with distance from the sea.

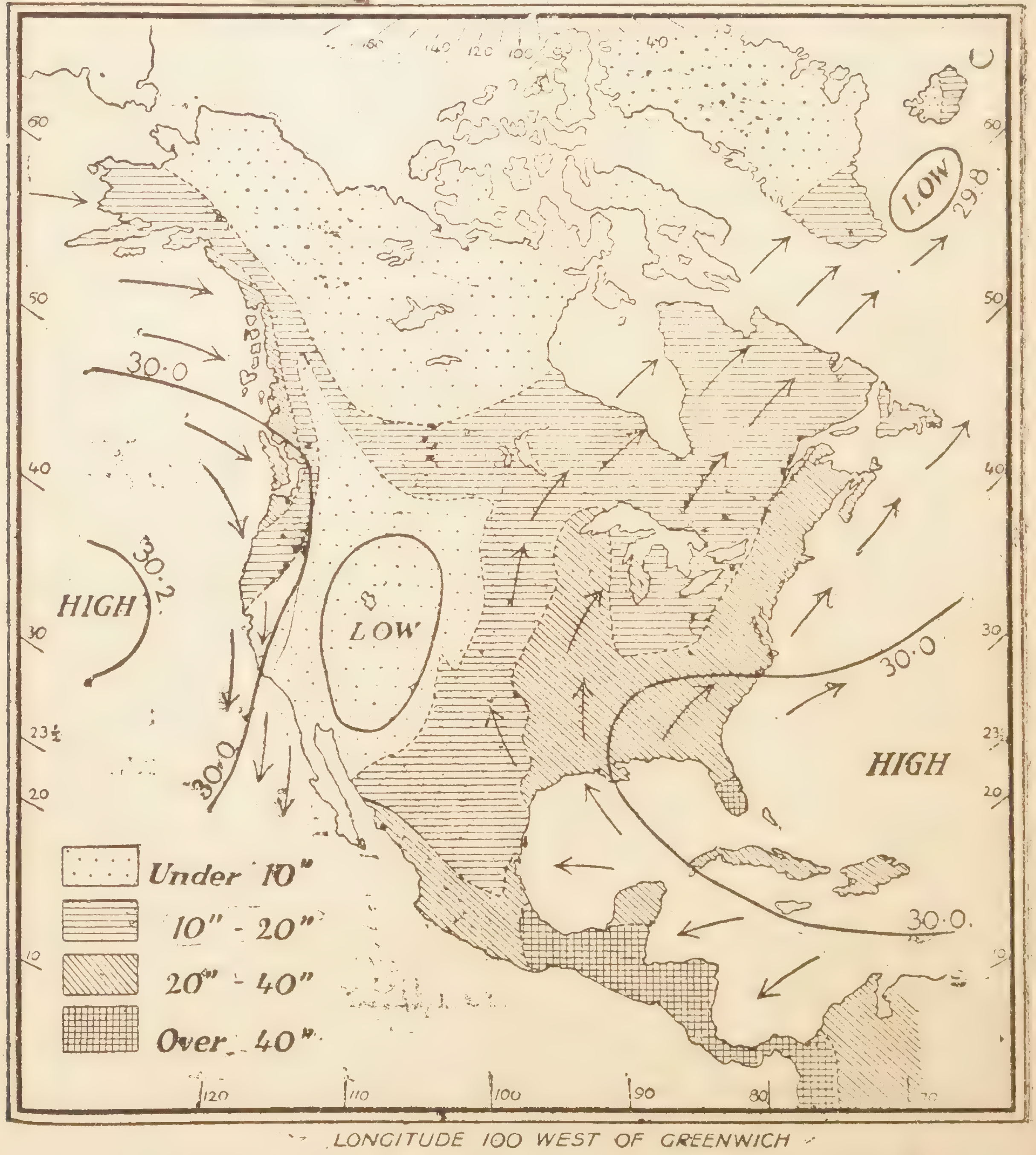

FIG. 18 North America: Rainfall.
Summer conditions. (May-Oct.)

In Mexico, Central America and the West Indies, the prevailing winds are the trades, blowing from almost due east. Hence the eastern half of Mexico, and almost the whole of Central America and the West Indies get heavy rain; but the rainfall is greater on the windward side of the islands than on the lee side.

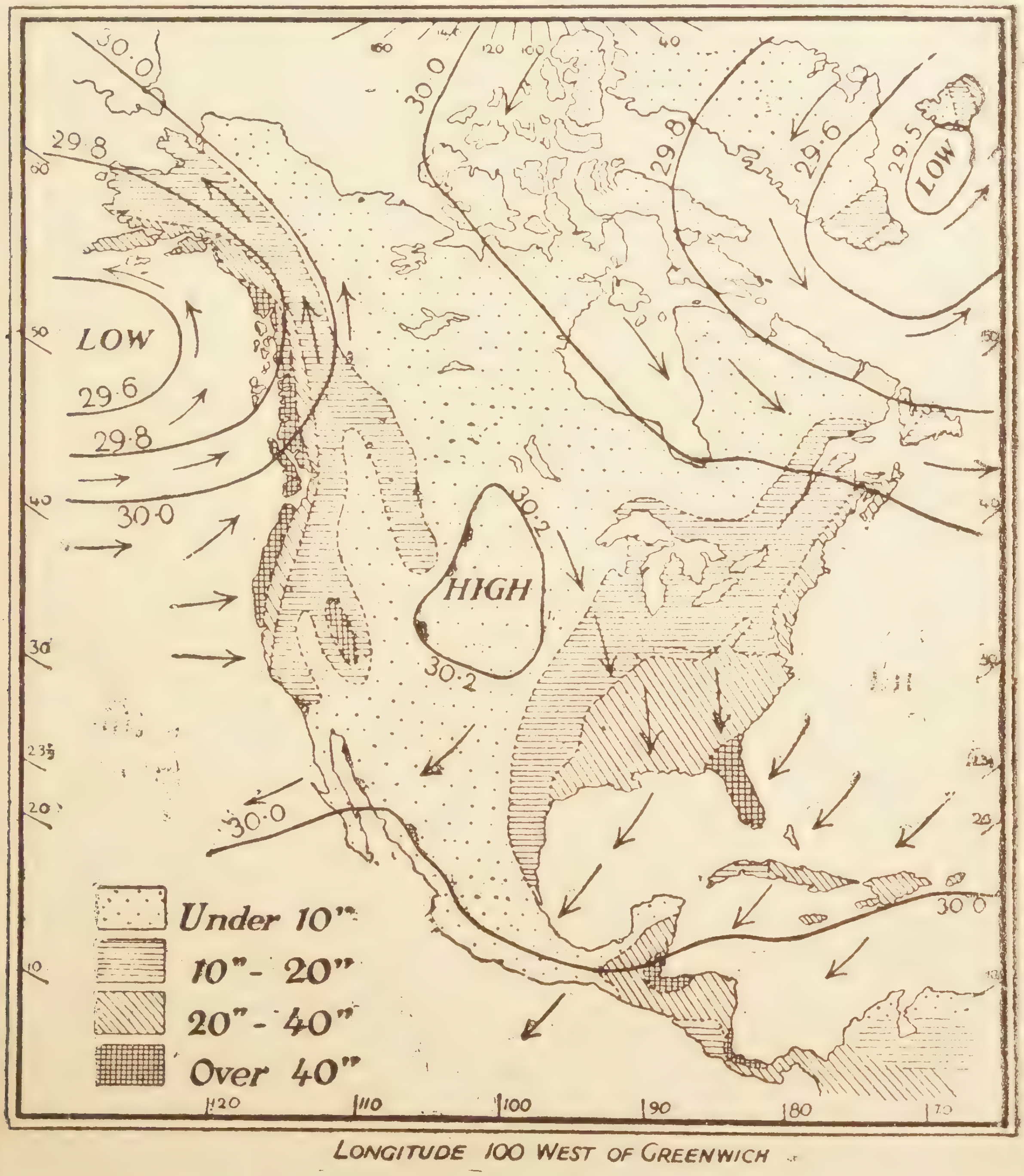

FIG. 19 North America: Rainfall.
Winter Conditions (Nov-Apr.).

On the Pacific coasts, the westerlies blow from the west in British Columbia and give rain to the coast; but the conditions being anticyclonic, rain is not abundant. On the coast of California, the winds are parallel to the coast and therefore in summer, there is no rain. Moreover, this area lies within the high pressure belt. San Francisco has westerly winds, but, as these cross a cold current, they do not bring moisture. As the mountain barrier lies close to the coast, moisture is not carried inland.

The rainfall of the Central Plains is due to the convectional air currents set up by the rapid heating of the ground in early summer while the upper air is still cool.

The south-west plateau is arid, being on the west side of the trade-wind belt ; moreover, it is a shut-up area.

Winter Conditions (Nov.—Apr.): The land is much cooler than the sea and *high pressure* conditions prevail over the land mass (Fig. 19). There is a general *outflow of dry winds* towards the ocean. Hence the interior gets least rain in winter. Low pressure or cyclonic conditions are found in the north-west on the Pacific and in the north-east on the Atlantic.

In the east and south-east, the winds are continental and off-shore winds ; but on account of cyclonic eddies which pass over this area there is rainfall.

In Mexico, Central America and West Indies, the prevailing winds are still the easterlies, but rainfall is lighter than in summer.

On the coasts of British Columbia. owing to cyclonic conditions rainfall is more abundant than in summer. Again in winter the land is much cooler than the sea and therefore there is greater condensation than in any other part of the year. On account of the mountain barrier rainfall is confined to the coast as in summer.

California comes under the influence of the westerlies and has rain ; hence its climate is of the " Mediterranean " type.

In addition to the shut-up plateaus in the south-west, Lower California is also rainless as it is cut off from the easterly winds.

A constant procession of cyclones and anticyclones passes over temperate North America from west to east. They are responsible for the sudden changes of weather there, especially in the Northern United States. In front of a cyclonic depression warm winds from the south blow, while the rear of the depression is marked by "cold waves" from the north. Tornadoes and hurricanes which give rain to the South-east States and the Atlantic coast have already been referred to.

The Chinook Winds: The high plains on the lee side of the Rockies in Western Canada and the Northern United States are subject to warm winds known as the *chinook* winds. The warm moist winds from the Pacific gives heavy rain on the west slopes of the Pacific cordilleras. Why ? (See p. 14 Part I).

When they cross the cordilleras and descend the leeward slopes of the Rockies they are dry and become warmed by compression. The Chinook is beneficial in winter, for it "licks up the snow as if by magic," and renders cattle-grazing possible ; but in summer it becomes a scorching wind that often ruins the crops.

The Arctic coast areas and the islands get very little rain as the winds are chiefly from the Arctic regions and are cold and dry.

THE CHIEF CLIMATIC DIVISIONS

Study Fig. 20, and recognise therein the following climatic divisions:—

(1) **The Arctic Region:** This includes the shore-lands, the islands and Greenland. The region has short

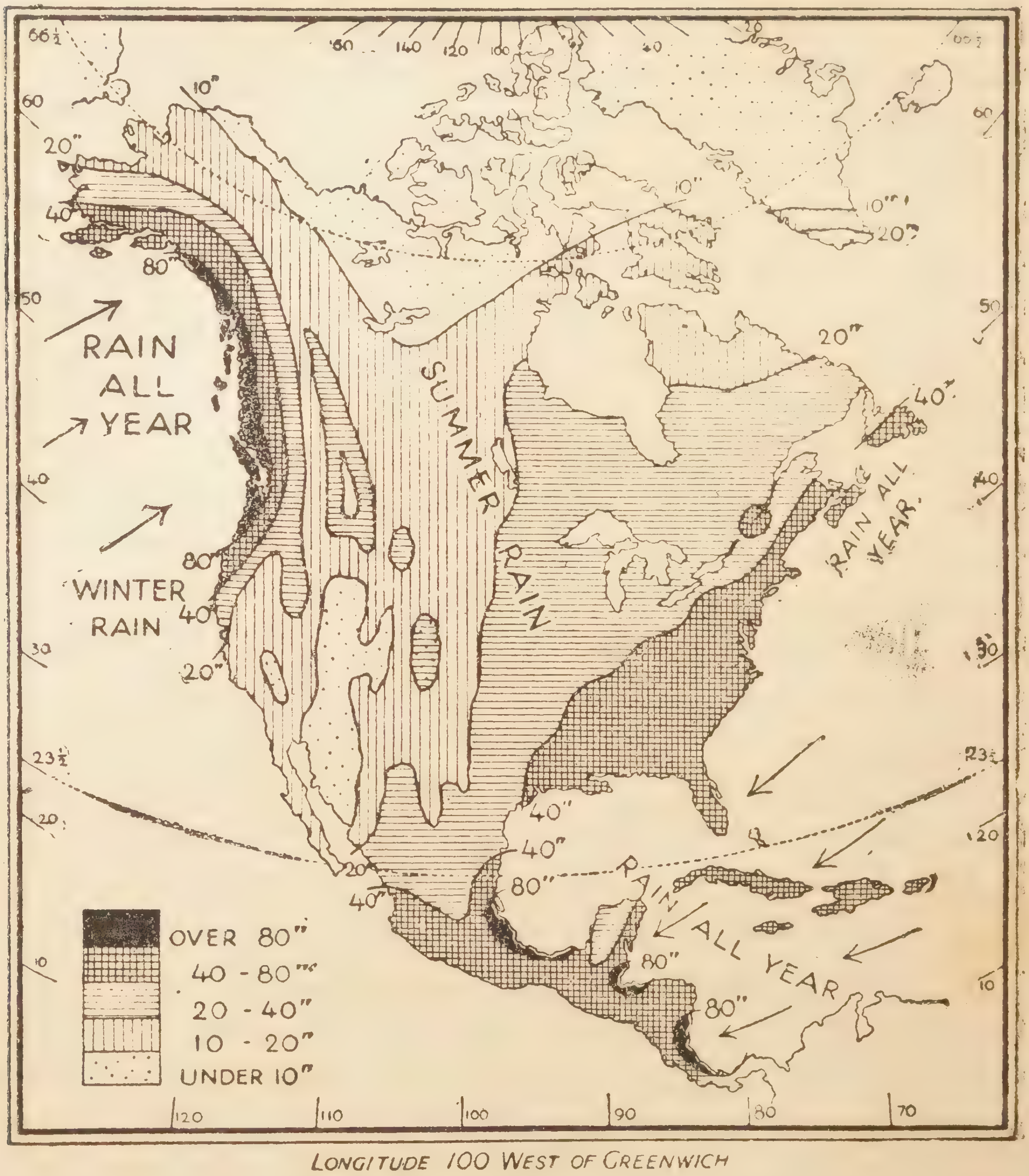

FIG. 20. Mean Annual Rainfall.

warm summers and long and very cold winters. During the greater part of the year the ground is covered with ice and snow. The climate is most extreme.

(2) **The Continental Interior:** This includes the high and the low plains. West of 100° W. Long. the rainfall is low, while east of it, it slightly increases. Rain falls mostly in early summer and is caused by convection.

Range of temperature is generally high, but it decreases from north to south. This area is subject to cyclonic disturbances and sudden changes of weather. Compare the range of temperature of the following places : Fort Churchill, 79° F.; Winnipeg 69° F. ; St. Paul, 57° F. Compare the rainfall (in inches) of Calgary with that of Winnipeg:

	J.	F.	M.	A.	M	J.	J.	A.	S.	O.	N.	D.	Year.
Calgary:	0·4	0·6	0·8	0·7	2·5	3·1	2·6	2·6	1·2	0·5	0·7	0·5	16·2.
Winnipeg:	0·9	0·8	1·3	1·6	2·2	3·3	3·2	2·2	1·9	1·4	1·0	0·9	20·7.

(3) **The North Pacific Coast:** This includes the coasts of British Columbia and Alaska. The climate is influenced by the westerly winds and the Pacific drift. Summers are warm and winters are mild. Refer to the temperature of Victoria. Rain falls throughout the year, but most rain falls in winter and on the seaward slopes of the mountains. The valleys in the plateau are dry.

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Victoria:	4·8	3·5	2·5	1·7	1·2	1·0	0·4	0·6	1·8	2·9	5·5	5·6	31·5.

This region can be compared with the coast of South Chile.

(4) **The Shoreland of California:** The climate is of the "Mediterranean" type ; summers are warm and dry, and winters are mild and rainy. This climate extends to the great valley of California and the Sierra Nevada. In amount the rainfall varies from moderate to scanty. San Francisco has a temperature of 49·5° F. for the coolest month and 59·3° F. for the hottest month, the range being 9·8° F. The valley has a greater range: *e.g.*, Sacramento, 27°F. Compare this area with middle Chile.

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	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
San Francisco:	4·8	3·6	3·3	1·7	0·7	0	0	0	0·3	1·0	2·6	4·7	22·7.

(5) **The Shut-up Plateaus:** These include the Snake River Plateau, the Great Basin, the Colorado Plateau

and the northern part of the Mexican Plateau. These are dry and the driest portion lies in Arizona. Yuma on the Colorado has an annual rainfall of only 3 inches.

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Yuma:	0·4	0·5	0·4	0·1	0	0	0·1	0·5	0·2	0·2	0·3	0·4	3·1.

(6) **The St. Lawrence Region:** This includes the east of Canada and the north-east of the United States. The summers are warm and the winters are cold, *e.g.*, Montreal : (July) 69° F ; (Jan.) 13° F. ; Quebec : (July) 66·3° F. ; (Jan.) 10°F.; Boston : (July) 71·3° F.; (Jan.) 27°F: The winter is less severe near the open seas, *e.g.*, St. John's : 24·2° F. Rain falls throughout the year, but there is a pronounced winter maximum, *e.g.*, Halifax and St. John's. The rainfall is due to the cyclones, and these are vigorous in winter. This area lies in the main track of the cyclones. But there are exceptions in the south, *e. g.*, Boston.

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Halifax:	6·0	4·7	5·1	4·6	3·8	3·8	3·7	4·6	4·1	5·5	5·9	5·5	57·3
Boston:	3·7	3·5	4·1	3·8	3·7	3·1	3·5	4·2	3·4	3·7	4·1	3·8	44·6.

(7) **The South Eastern States:** These include the Gulf plains and the South Atlantic Coast. The winters are mild and summers are hot, *e.g.*, Charleston : (Jan.) 49·3° F. ; (July) 81·3° F. ; New Orleans : (Jan.) 53·9° F. ; (July) 81·5° F. Rain falls at all seasons, but especially in summer. Cyclones frequent this area all the year and cause heavy rain. The coast-lands receive rain from the hurricanes which originate east of the West Indies, and often move to the Gulf of Mexico, whence they recurve towards the north-east, causing much havoc on the way.

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Charleston:	3·1	3·1	3·3	2·4	3·4	5·3	6·2	6·7	5·2	3·9	2·7	3·3	48·6.
New Orleans:	4·5	4·3	4·6	4·5	4·1	5·4	6·5	5·7	4·5	3·2	3·8	4·5	55·6.

(8) **The Tropical Region:** This includes the coast of Mexico, Florida, Central America and the West Indies. This region is hot throughout the year with a low range of temperature; *e.g.*, Vera Cruz : (Jan.) 71·4° F. ; (July) 81·7° F ; Kingston: (Jan.) 75·7° F; (July) 81·7° F. Rain falls all the year, but mostly in summer.

	J.	F.	M.	A	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Vera Cruz:	0·4	0·6	0·6	0·1	4·3	12·5	14·8	8·9	11·6	9·0	3·2	2·0	68·0.

Places on the windward side get more rain than those on the leeside; *e.g.*, Kingston (Jamaica) has an annual rainfall of 35·6 inches, but Port Antonio has 139·2 inches. Colon has 129·4 inches, while Panama has 56·4 inches.

The climate of Mexico is modified by altitude. Mexico City (7,474 ft.) has a mean monthly temperature of 60° F., and an annual rainfall of 23 inches. Contrast it with Vera Cruz. The west coast is almost arid. There are three climatic regions in Mexico based on altitude : *tierra caliente* from sea level to 3,000 ft.; *tierra templada*, up to 7,000 ft.; and *tierra fria*, over 7,000 ft. Most of the plateau is above 6,000 ft. Compare the Andean Zones.

EXERCISES

(1) Will North America have a uniform climate or a great variety of climates? Give reasons for your answer.

(2) "Range of temperature increases with distance from the sea." Illustrate from N. America.

(3) Which part of North America has the greatest range of temperature? Why?

(4) "The west-coast of Canada is very much warmer than the east coast." Why?

(5) What are "cold and hot waves"? Why does North America experience these?

(6) Account for the fogs of Nowfoundland.

(7) What is the difference between a "stream current" and a "drift" current?

(8) In what respect do the January isotherms differ from those of July? Why?

(9) Represent graphically the mean monthly temperatures in ° F. of the following places:

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Victoria:	40·1	41·6	44·2	48·9	53·5	56·1	60·8	60·2	56·6	51·5	45·8	42·8	50·3
Winnipeg:	2·6	1·0	14·7	38·6	51·1	62·1	65·9	63·1	53·9	41·5	24·5	7·4	34·9
Montreal:	13·2	14·6	25·9	41·7	55·0	65·1	69·0	66·3	58·8	46·1	33·1	19·1	42·3

What do you learn from the graph as regards the comparative temperatures of these towns?

(10) Explain, with the help of a diagram, what is meant by a "Cyclone"? Which part of North America has rain on account of the cyclonic disturbances?

(11) Name the two wind systems prevailing in North America. Which parts of North America get rain from these systems respectively?

(12) Name the area in North America which has (a) rain all the year, but most rain in winter; (b) rain in winter only; (c) rain all the year, but most rain in summer. Give reasons for your answer.

(13) Draw diagrams to show the mean monthly rainfall (in inches) of Victoria, San Francisco and Yuma. Write what you infer from the diagrams about the seasonal distribution of rainfall in these towns. Which towns of South America correspond to these towns respectively as regards the distribution of rainfall?

(14) What are "Chinook winds"? How are they caused? How are they useful?

(15) What are the two chief elements of climate? What factors determine climate? Illustrate, as fully as you can, from the climate of North America.

CHAPTER V

VEGETATION, ANIMALS AND NATURAL REGIONS

The natural vegetation of any region is, as you have already learnt, mainly dependent on rainfall. Fig. 22 shows the natural vegetation of North America. Compare it with (Fig. 20) the mean annual rainfall map. Where rainfall is abundant *forests* occur ; in areas of moderate or low rainfall there are *grasslands* ; and in arid regions where the mean annual rainfall is below 10 inches *deserts* are found. The heavy rains of the Pacific and Atlantic coast-lands and of the shore-lands of the Gulf of Mexico support thick forests. The coniferous forest of Canada is an exception to this rule ; but this forest can grow well where there is heavy snow-fall in winter and light rain in summer. The grasslands stretch between the Rockies and the Mississippi where the rainfall is from 10 to 30 inches. To the west of 100° W. long, the rainfall is below 20 inches and to the east, it is from 20 to 30 inches. Hence to the east of the 100° W. meridian lie the rich *prairies*, while to the west of it lie the *drier grasslands* and cattle ranches. The intermont basins and plateaus of the Western Cordillera support vegetation of a *semi desert* character which passes into the *true desert* in Arizona and North Mexico.

FORESTS

The forests of North America are of four distinct types: (1) Tropical Forests of the Gulf coast ; (2) the

Atlantic Forests ; (3) the Pacific Forests ; and (4) the Conifer Forest of Canada.

(1) **Tropical Forests** flourish in the lowlands of South Florida, Mexico, Central America and the West Indies. The heavy monsoonal rains and the high temperature favour the growth of dense forest. Palms are characteristic of these forests. The " royal palm " of the West Indies is as useful to the people there as the palmyra is to us in South India. On the coastlands the cocoanut palm thrives well. Mahogany, rosewood and other cabinet woods and rubber are valuable products of these forests.

(2) **The Atlantic Forests** contain both *conifers* and *deciduous* trees. Conifers are evergreens having needle-shaped leaves which they do not shed in winter ; but deciduous or broad-leaved trees shed their leaves in winter. Conifers are found chiefly in the north and broad-leaved trees in the south. In the Southern States these trees become evergreens, that is, they do not shed their leaves, for the southern winters are not cold. The most important tree of the New England States and South-eastern Canada is the *white pine.* It is a large tree growing to a height of from 70 to 150 feet and its timber is used in building. In the sandy areas of the Southern States grow the *yellow pines.* The chief broad-leaved trees are the oak, elm, maple, chestnut, etc. These trees yield hard wood which is used in the making of furniture and implements. Sugar is obtained from the maple. Important substances like tar, turpentine and resin are obtained from the pines and are exported in large quantities,

gum

Now great areas of these forests have been cleared, and agriculture is extensively carried on.

(3) **The Pacific Forests** extend to the whole length

of the western side of Canada and the United States. In the north the trees are chiefly conifers ; but, in the Californian region of winter rainfall they are evergreens of the warm temperate variety.

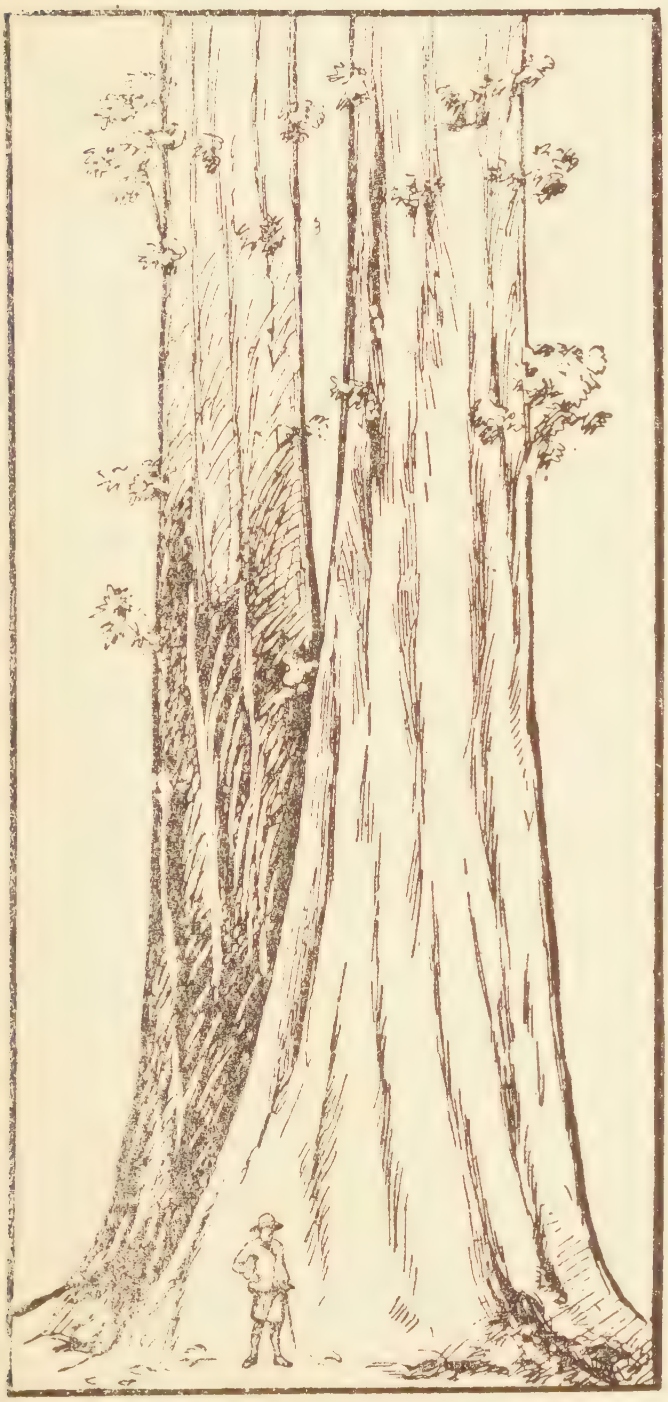


FIG. 21. Big Trees of California. Note how small the man appears by the side of the trees.

The famous *Douglas fir* of British Columbia, the *firs* and *cedars* of western Washington and Oregon, and the *redwoods* of the coast ranges of Northern California and the west slope of Sierra Nevada grow to enormous sizes. The firs attain a height of 200 to 300 feet, with a diameter at the base of from 8 to 10 feet. The redwoods are taller and grow to a height of 300 or more feet, with a diameter at the base of 15 or 16 feet, and in certain instances of over 20 feet. Puget Sound is the chief outlet of this most important lumbering region. The celebrated "big trees" (Fig. 21) of California are not to be confounded with the redwood described above. They average about 275 feet in height with a diameter near the ground of about 20 feet. One of the tallest has a height of 325 ft., and the largest a diameter of nearly 36 feet, four feet above the ground. These trees are found very commonly on the Sierra Nevada. Some of the trees must have been growing for over 2,000 years, judging by the annual rings. "Owing to the remoteness of the 'big trees' from commercial centres, they have escaped to a great extent the destruction which everywhere attends the advent of the white man." (Prof. Israel Russel.)

distance

Coming

(4) The great **Conifer Forest** of Canada stretches for at least 3,000 miles east to west and is from 450 to 700 miles wide. Northward it becomes thinner and stunted and merges into the Arctic tundra. In the east it forms part of the North Atlantic Forest, and in the west, part of the North Pacific Forest. Spruce and pine are found on the upland slopes; larch, willow, poplar and birch grow along the shores of the great lakes and rivers. In the south-centre of this belt lies a broad wedge of treeless prairie in Alberta and Saskatchewan.

Short

Is a land of tree.

In spite of the great area covered by this forest, it is of comparatively small economic importance; for the wood of the trees is of inferior quality and not generally suitable for lumber. The manufacture of wood-pulp, so largely employed in the making of paper, is, however, an important industry connected with the timber of this forest.

GRASS-LANDS

Grass-lands are chiefly found in the interior plains south of the conifer belt, and between the Atlantic and Pacific forests. We have already seen that these plains receive most of their rain in summer. Owing to the heat of summer, the rain is only sufficient to water the top layers of the soil. These conditions are favourable for grass which has a *short life cycle.* To the west of the Atlantic forest lie the broad "natural meadows," called *prairies.* Still farther west are the dry pasture-lands of the great plateaus which lie on the eastern side of the Rockies.

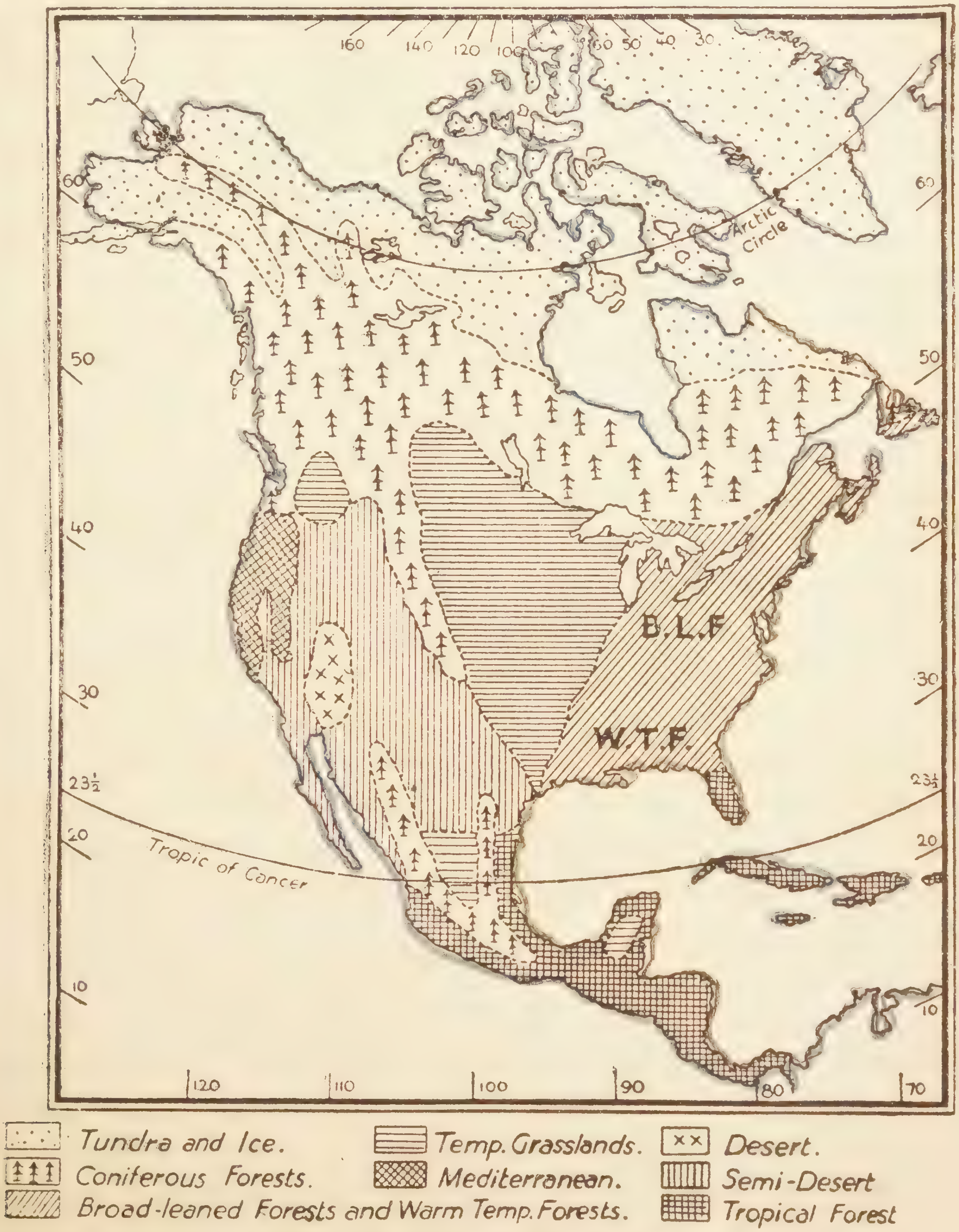


FIG 22. Natural Vegetation.

Though the prairies have an annual rainfall of over 30 inches, they are treeless. This is due to (1) the long periods of drought between the summer rains; (2) the exceedingly fine soil; and (3) the hot dry winds of great violence which blow from time to time. Further, in times of long droughts, the grass and other vegetation burns readily; and fire spreads rapidly destroying young trees. But trees are met with near rivers.

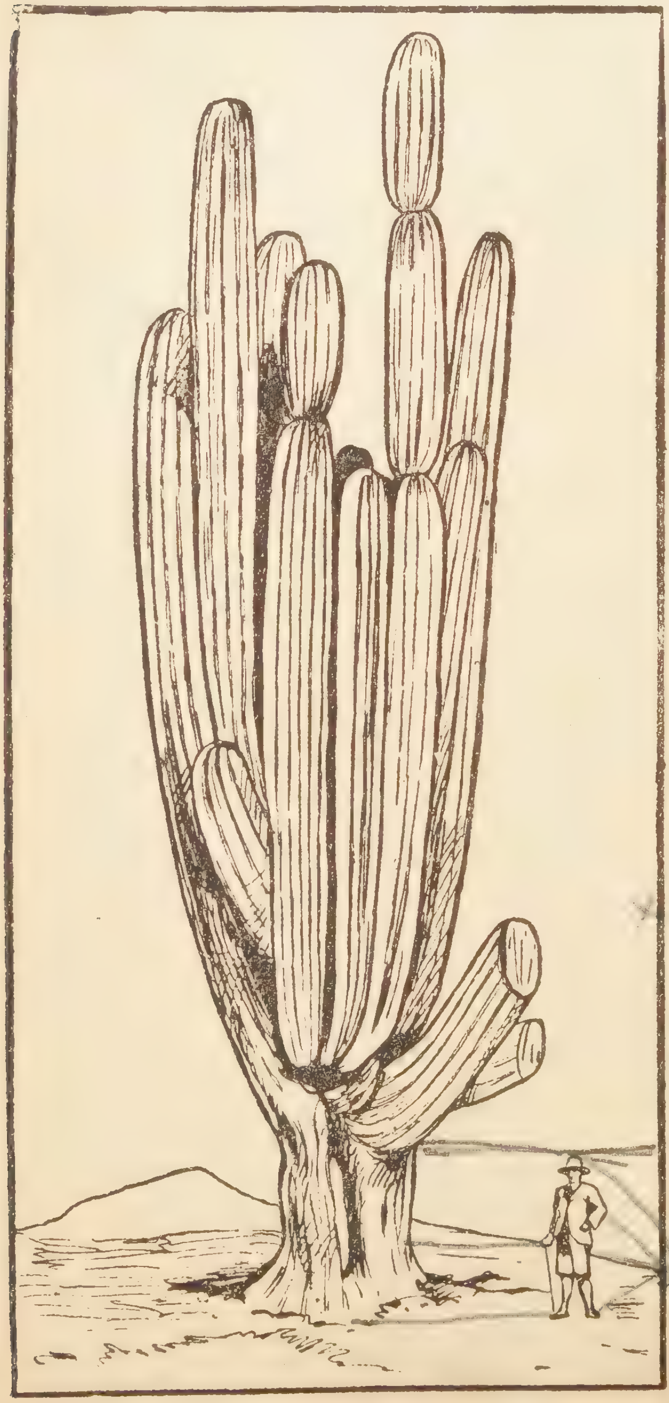


FIG. 23. Giant Cactus. (Arizona.)

The prairies have now been converted into great wheat and maize farms; and the dry grasslands of the western plains form the chief cattle and horse-ranching areas.

The shut-up plateaus and basins of the western mountain system are *scrub-lands* as the rainfall there is very slight.

Hot deserts are found in Arizona and North Mexico where the temperature is the highest and rainfall the lowest in North America. The most common vegetation is the "*sage-brush*". The *bunch-grass* grows in little tufts or bunches and is found along the margins of the desert. The chief vegetation of the true hot desert is the *Cactus* with its numerous thorns. In some cases, as in south-western Arizona, it grows to the height of trees and is known as the '*Giant Cactus*' (Fig. 23).

The cactus has no leaves, and so exposes little surface to the air for evaporation. In its great fleshy stem it stores water to use through the long, dry seasons.

The **Tundra** or **Ice desert**, known in North America as the *Barrens* or Barren Grounds, occurs on the Arctic shoreland and archipelagos. This has a short, warm summer and a long, dreary winter. The ground is permanently frozen, excepting at the surface which thaws out for a few weeks in summer. Trees cannot grow; and the vegetation consists of small berry-bearing bushes, mosses and lichens. Towards the south a few grasses and small flowering plants are found; and stunted trees make their appearance.

The plants on the tops of mountains resemble those of the Arctic regions. Why?

ANIMALS

Animals of the Far North: Few large land animals can thrive here as the climate is so cold that plant food is rare. The *Caribou* or reindeer, the *musk-ox*, the *polar bear* and the Arctic *fox* and *hare* are the chief land animals. All the animals, except the polar bear and the white fox, live upon plants, such as berries, grass and moss.

The musk-ox combines the characteristics of the sheep and the ox, and has long smooth, brown hair and a yellowish underwool. Its horns, broad at the base and curving and tapering to a sharp point, resemble those of the Cape buffalo. A full-grown musk-ox measures about 8 feet in length, and 3 feet 9 inches in height. It has never been seen south of lat. 58° N. and west of the Mackenzie River.

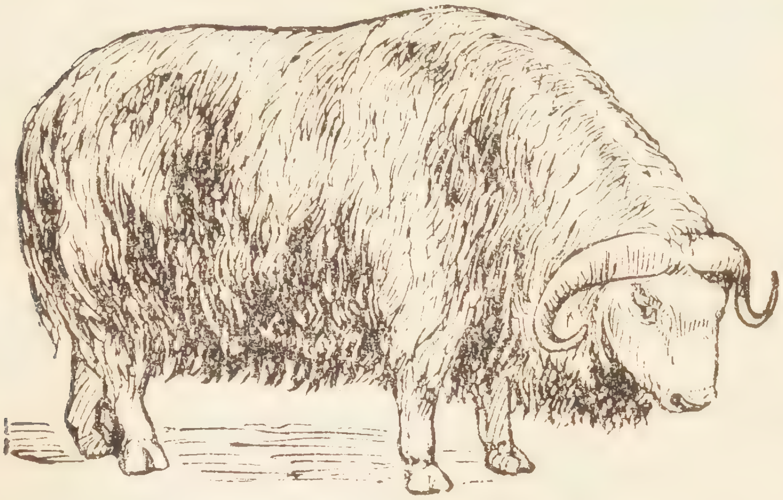


FIG. 24. Musk-Ox

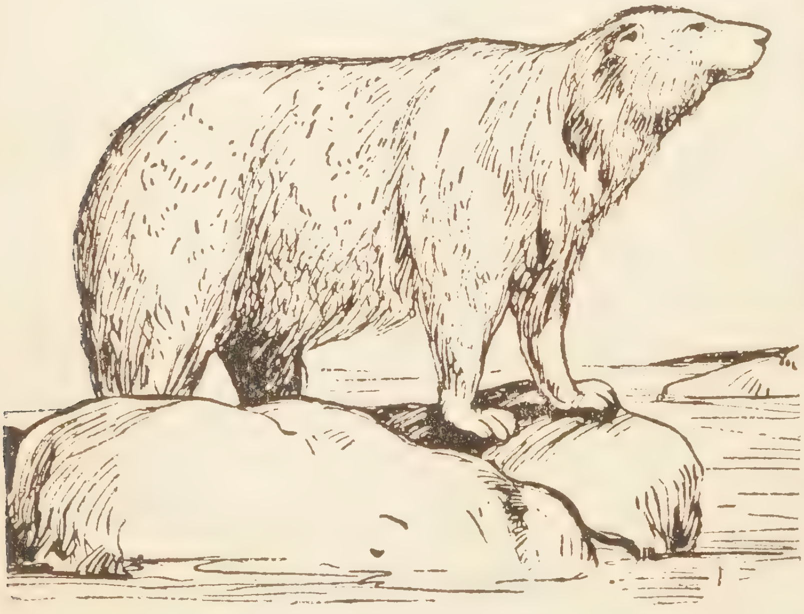


FIG. 25. Polar Bear

Two kinds of caribou have been known, the woodland caribou and the Barren-Ground caribou. The former is about twice the size of the latter and has a height of 4½ feet at the shoulders. The Barren-Ground caribou occurs in large herds in northern Labrador, and on the treeless region to the west of the Hudson Bay. The hunters have so much reduced the herds that it has been found necessary to place the caribou under state protection in Alaska, and to introduce reindeer from Asia or Europe. The caribou and the reindeer feed on a plant, called the "reindeer moss."

Another important animal found in the polar region is the *Eskimo dog*, "the companion and transport animal" of the Eskimo of North America.

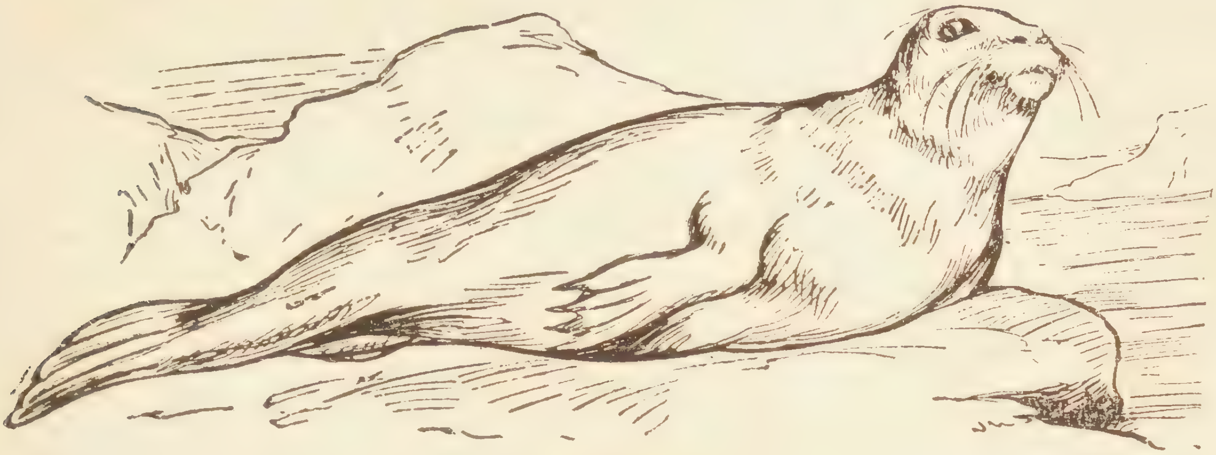


FIG. 26. Seal

In the seas live *seals*, *walruses* and *whales*. The seal forms the principal food of the Eskimo and the polar bear, and is valuable for its oil and skin.

There are many varieties of sea birds and a large number of land birds. These birds, as well as many of the animals, migrate southwards during the winter, the birds going as far south as North Carolina.

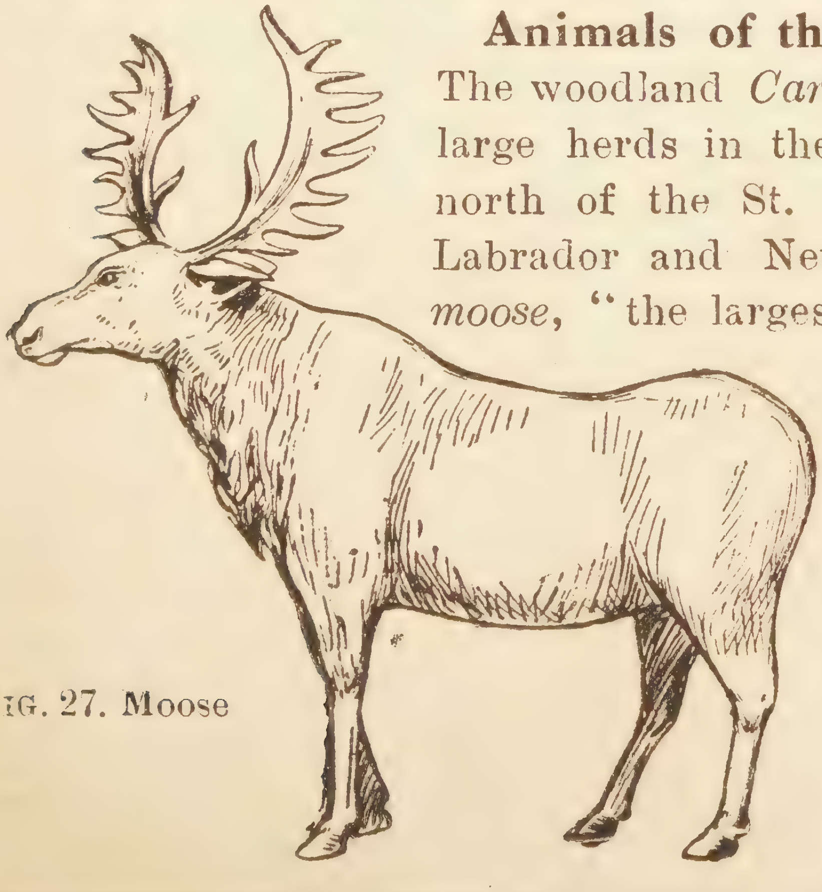


FIG. 27. Moose

Animals of the Conifer Belt: The woodland *Caribou* is found in large herds in the dense forest belt north of the St. Lawrence and in Labrador and Newfoundland. The *moose*, "the largest living representative of the deer tribe" ranges over the whole of the Canadian Forest. A full-grown male moose is from 7 to 8 feet high at the shoulder, and the tips of his antlers are often 12 feet above his hoofs when he stands erect. Stringent laws are now enforced for the protection of this animal. The *beaver*, the *skunk*, *ermine*, *marten*, *sable*, *fox*, *mink* and *otter* are some of the fur-bearing animals of this region. The *lynx* (or American wild cat) and the *grizzly bear* are characteristic of the Pacific forest.

Animals of the Western Mountains: The *wapiti* or North American *elk* is next in size to the moose, and lives in the wildest portion of the Pacific mountains to the north of the Snake River. A full-grown animal is some 7 or 8 feet high at the shoulders. Like many other animals of North America it is protected by severe game laws. The "*bighorn*", or mountain sheep, is the most surefooted of mountain animals. Its great curved horns often exceed 3 feet in length. The companion of the bighorn is the *mountain goat* or *mazama* which is in reality more nearly related to the antelope than to the sheep. In general, it is smaller than the bighorn, and rarely comes below the timberline.

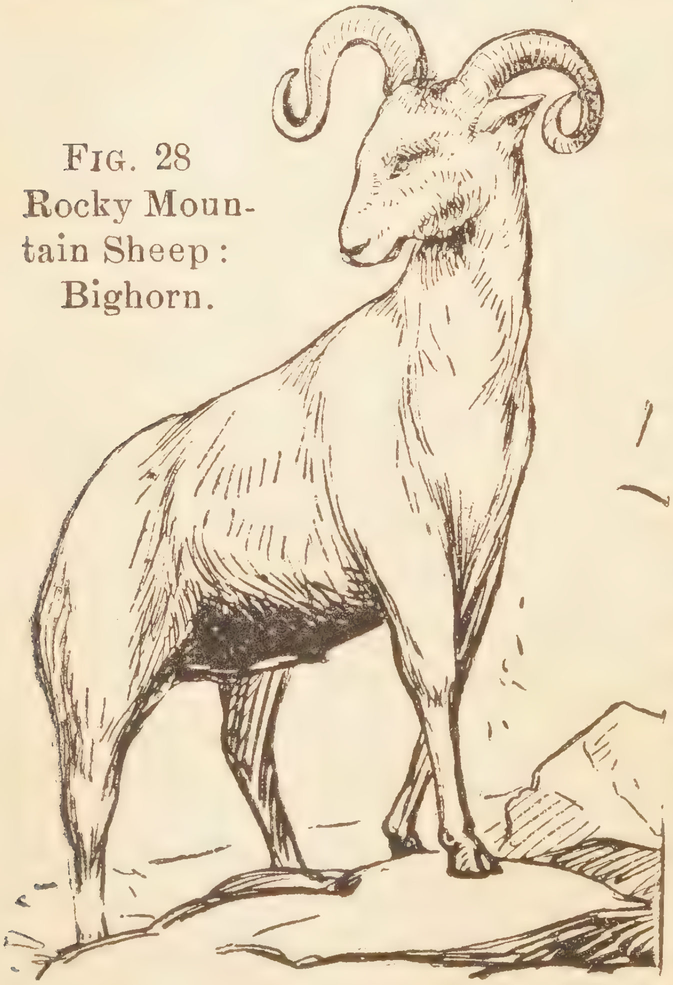


FIG. 28
Rocky Mountain Sheep: Bighorn.

Animals of the Great Plains: The chief animal of the prairies is the *bison* or 'buffalo'. It once roamed in millions over the plains from the Mackenzie to the Gulf of Mexico; but it is now represented by a few scattered herds which are strictly preserved in parks. In 1872—74 nearly 5,000,000 were killed for their hides and tongues.

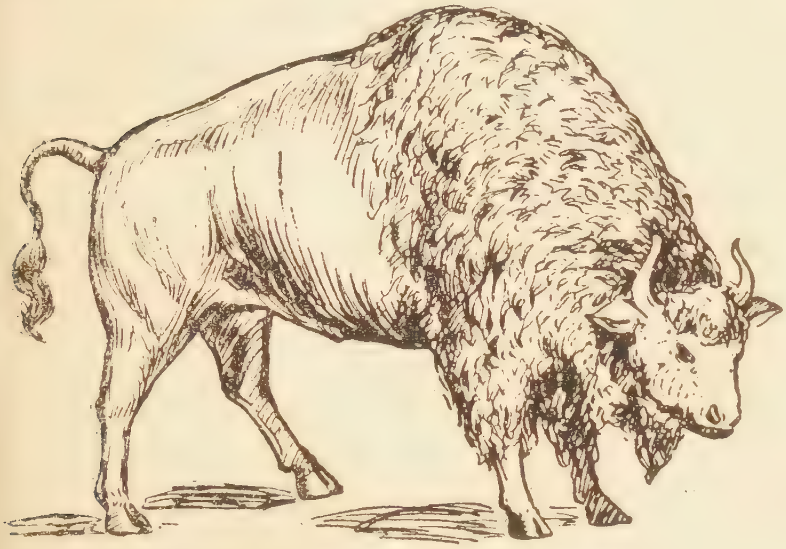


FIG. 29. Bison

Prairie wolves or *coyotes* and *prairie-dogs* (which live in small communities) are common on the western plains. By far the most important animals of the prairies are those which have been introduced by Europeans—horses, cattle, sheep and pigs. All these have now become sources of vast economic wealth.

Animals of the Tropics: The *panther* and the *jaguar* (see S. America) haunt the tropical forests of North America. The skin of the jaguar is as beautiful as that of the tiger or leopard and is highly prized for rugs. Brilliantly coloured *birds*, millions of *insects* and numerous species of *snakes* are found ; in the mouths of rivers flowing into the Gulf of Mexico *alligators* are common.

Fish: Fishing is one of North America's most important natural sources of wealth. The Grand Banks of Newfoundland and the shallow waters of the Gulf of St. Lawrence and along the Atlantic coast are the chief fishing grounds. *Cod, halibut, shad, haddock, mackeral* and *herring* are only a few of the fish that are caught. *Oysters* are found along the east-coast, the chief region being the Chesapeake Bay. *Lobster* fishing is also carried on, especially off the coast of Maine and Nova Scotia.

Enormous quantities of *salmon* are caught all along the broken coast-line of British Columbia, and the lower courses of the North Pacific rivers.

NATURAL REGIONS (Fig. 30)

In dividing a continent into its Natural Regions, the political boundaries (which are mainly artificial) are

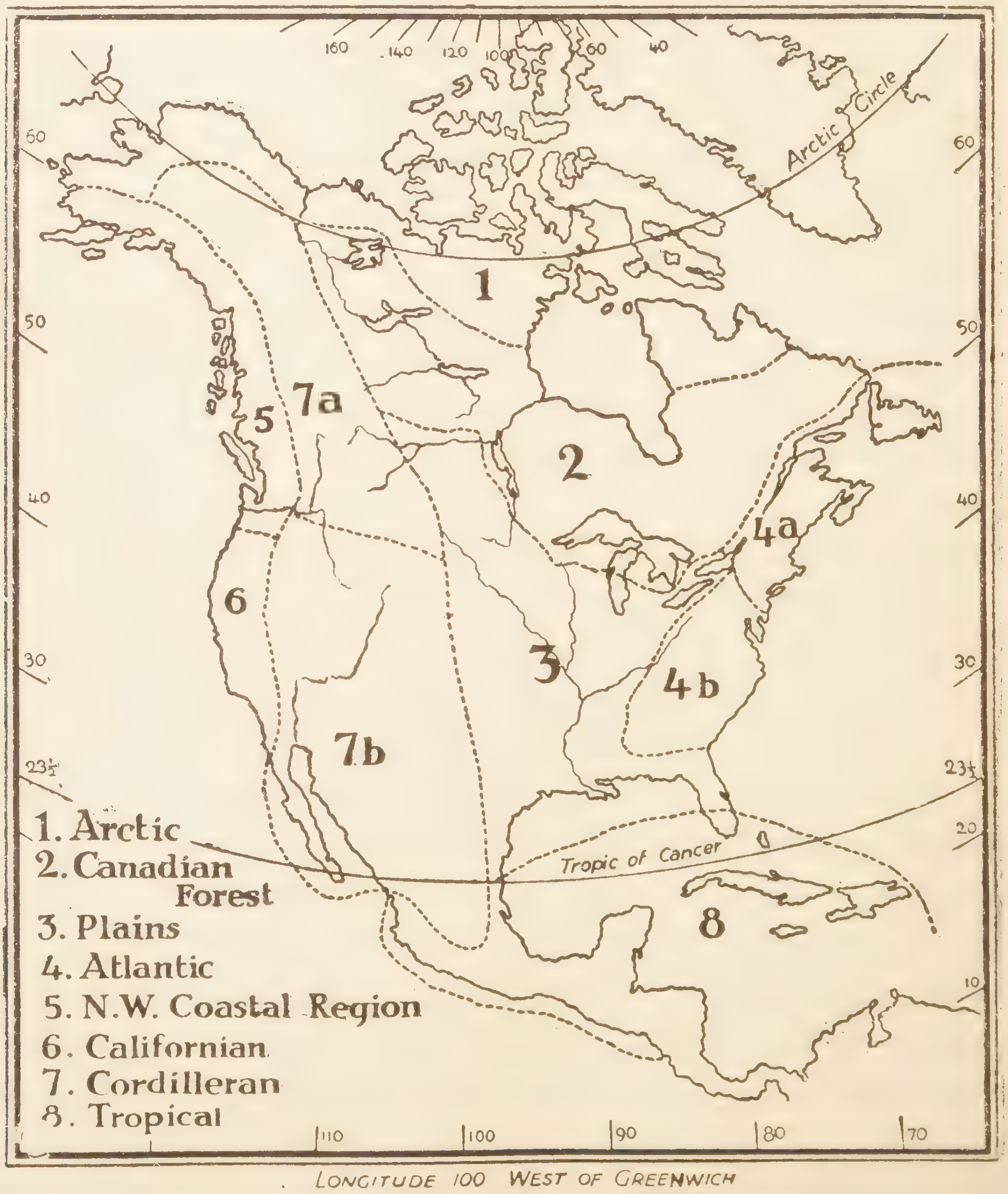


FIG. 30. Natural Regions.

ignored. Each region has, generally speaking, a certain definite type of structure, climate and vegetation. Hence in each division the same kind of human activities prevails; but it is possible "to make this division in a variety of ways, according as we take larger or smaller divisions." North America can be divided into the following *Natural Regions* as shown in Fig. 30.

(1) **The Tundra or the Arctic Region:** This includes the Arctic shoreland, islands and Greenland. Greenland consists of highlands, while the other portions are more or less lowlands. The climate is most extreme. The winters are severe and long; and summers are cool and short. The ground is always frozen so that very little vegetation can live. During the short summer the surface snow melts and some berry-bearing shrubs grow. Mosses and lichens are the food of the caribou and the reindeer. The chief people are the Eskimos who are mostly hunters and fishers.

(2) **The Northern Forest or Canadian Interior:** This is the most extreme part of the continent, the range of temperature being from 60° to 80° F. The westerlies are *descending dry* winds and bring little rain. Rainfall occurs chiefly in summer and there is heavy snowfall in winter. The winter snow "reserve" and the scanty summer rainfall are able to support an extensive Conifer Forest. The northern part of the forest is the *fur* country where fur-bearing animals are snared and trapped. The chief occupations along the southern edges of the forest are the cutting down of timber and sawing it into planks and the manufacture of wood pulp used for paper. In the lumber region of Canada, in order to keep up the future timber supply, a day is set apart each year when children plant young trees.

(3) **The Plains South of the Forest Belt:** These stretch from the Conifer Forest to the Gulf of Mexico and extend from the Appalachian to the Rocky Mountains. This region can be divided into (1) the wetter eastern portion, called the Prairie Plains and (2) the drier western portion, called the High Plains. The Gulf Plains also come under this region. The *rainfall increases* and *range of temperature decreases* from north to south. Most rain falls in summer. The Mississippi valley gets its warmth and moisture from the southerly winds from the Gulf of Mexico. The main occupation on the Gulf and Prairie plains is *agriculture*, and that on the High Plains is *cattle and horse-ranching.* Why? The northern portion of the low plains is *wheat-area*, and includes the south-central portion of Canada. The central portion is chiefly *maize* area, and the southern portion is mostly *cotton* area.

(4) **The Atlantic Region:** This consists of two sub-divisions, the northern and the southern regions. In the north the range of temperature is higher than in the south. The prevailing westerlies are *continental* winds; but this area gets rain throughout the year on account of the *cyclones.* The natural vegetation is forest. The northern region includes New England and the maritime provinces of Canada. This is the busiest part of North America where manufactures are highly developed owing to the great supply of water and electric power, provided by the numerous falls and rapids. Commerce is facilitated by excellent harbours. Farming, lumbering and fishing are other occupations. The southern portion has the extensive Appalachian coal, iron and petroleum fields. Great iron and steel works have been established, and the water-power along the Fall Line has produced many manufacturing centres.

Made easy

(5) **The North-West Coastal Region:** This includes the coasts of Alaska, British Columbia and the Northern states of the Pacific Coast of U. S. A. The climate is *equable* and *rainy*, for it is in the belt of the westerly winds. The mountain slopes are heavily forested; hence lumbering is an important occupation. Fishing and fruit-farming are other occupations. The broken coast-line affords excellent harbours.

(6) **The Californian Region:** This is the North American "Mediterranean" region with *dry summers* and *wet winters*. The slopes are densely forested. Lumbering, mining and the cultivation of fruits and grain in the Great Valley are the chief occupations; but fruit-growing is more important than the rest.

(7) **The Cordilleran Region:** This extends from Alaska to Mexico and includes the Cordilleras and the intermont plateaus. The windward slopes of the mountains have rain and are therefore forested, while the shut-up plateaus are dry. Hence desert and semi-desert conditions prevail. This is a region of extremes. Rainfall decreases from north to south so that the southern part of this region is a desert. In the semi-desert area in the north some wheat and fruits are cultivated with the help of irrigation. Many minerals, such as gold, silver, copper and lead are found in this region and hence mining is an important occupation.

(8) **The Tropical Region:** This includes Central America, South Florida and the West Indies. The climate is hot and wet and range of temperature is low. Tropical forests form the natural vegetation, and along the coastal plains are plantations of all kinds of tropical products.

EXERCISES

(1) Explain with reference to North America the relation between natural vegetation and rainfall.

(2) Mention the different types of vegetation that would be met with on a journey from San Francisco to New York.

(3) Which areas in North America are deserts? Why?

(4) Give examples to show that plants adapt themselves to their environment.

(5) "In spite of 30 inches rainfall, the prairies are treeless." Why? Into what three belts are the prairies divided?

(6) Where are the great cattle and horse ranches? Give reasons for your answer.

(7) Explain: "Mexico exhibits many vegetation regions dependent upon elevation."

(8) In which of the vegetation zones would you find: (a) mosses and lichens; (b) giant trees; (c) the spruce and pine; (d) the oak; (e) palms; (f) the yellow pine?

(9) In which of the natural vegetation zones would you expect to see (a) the caribou; (b) the moose; (c) the musk-ox; (d) the lynx; (e) the bison; (f) the jaguar?

(10) Write short notes on each of the wild animals given in Q 9 (a) to (f)

(11) Which forests of North America are the home of numerous fur-bearing animals? Name the chief fur-bearing animals.

(12) What is a "natural region"? How does it differ from a political division? Write in a tabular form the natural regions of North America with (a) the surface features and climatic conditions; (b) the natural vegetation; (c) the human activities in each of the regions.

CHAPTER VI

PEOPLES, POPULATION AND POLITICAL DIVISIONS

AMERICA was inhabited for thousands of years before it was discovered by white men. Columbus gave the name *Indians* to the people living in the southern part of the continent, thinking that he had discovered India. Those living in the extreme north are now called the *Eskimos*, (Fig. 31) a word which means rawflesh-eaters.

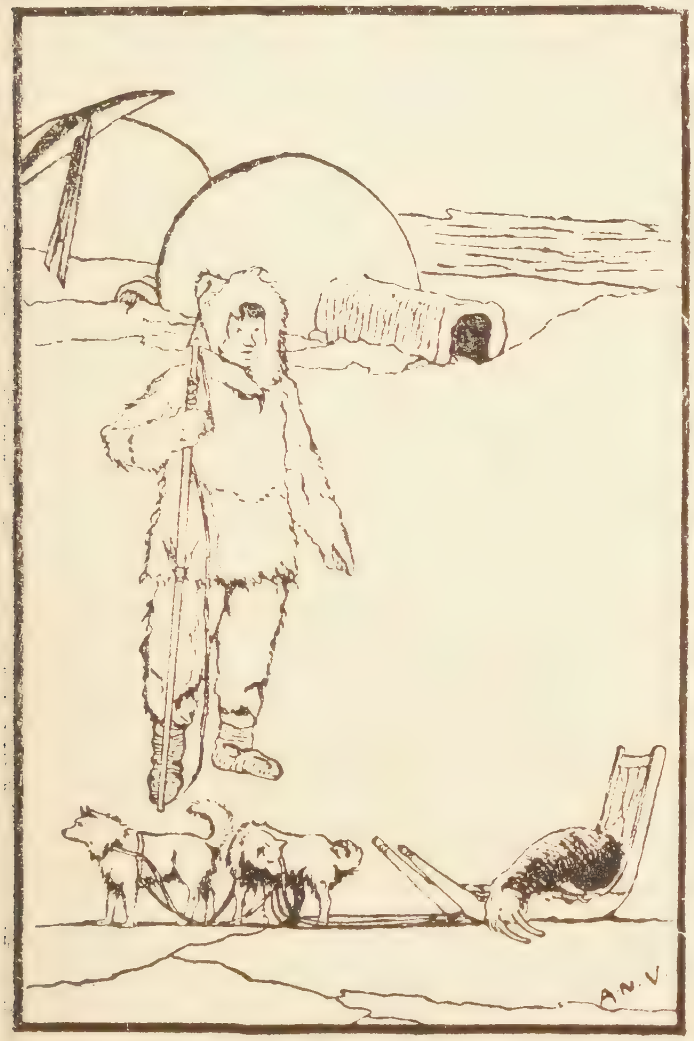


FIG. 31. The Eskimo, his dogs and sledge.

Note the icehouse with its tunnel-like entrance and the Kayak. Why is the latter placed high up? What dead animal lies on the sledge?

(1) **The Eskimos:** These people live on the Arctic Shoreland and on the coasts of Greenland. Their home land is one big frozen desert; hence it is not capable of supporting much life. So all that the Eskimo wants he has to find on the sea. There he catches the seal, the walrus and the whale and from these he gets his food, his clothes, his

tent (summer house) and many other things he needs. Fish are caught in the sea and in the open rivers in summer. The Eskimo uses a peculiar kind of boat called *kayak* which is made of driftwood or whalebone and is covered with skin. The animals are hunted with *harpoons* and *spears*. The harpoon is a long piece of wood with a sharp head at one end and a piece of rope at the other. The heads of spears and lances are generally made of stone or bone. The Eskimo has to get his food amid great difficulties and he is helped by his *dogs* which are probably domesticated wolves. Every Eskimo has his team of dogs to draw his *sledge* over the frozen land and sea.

In summer the Eskimos live in *portable skin tents*, and in winter they live in ice-huts, called *igloos*. The igloo is entered by means of a low tunnel of ice which has a skin door at its end. Oil lamps are used instead of fires, the oil being obtained from the blubber of the seal and the walrus. The lamp is made of stone, and the wick is only moss. The people do not wash themselves very often as water is hard to get, except by melting the snow. In spite of the unfavourable conditions under which they live the Eskimos are strong, sturdy people. But they are now declining in numbers owing to contact with white men from whom they get intoxicating liquors and contract diseases. Their eyes resemble those of the Chinese, and this had led people to think that they should have come from Asia before the Bering Strait was formed.

(2) **The Indians** (Fig. 32): This name is applied to all the natives of North and South America south of the lands occupied by the Eskimos. They are often referred to as 'Red' Indians; but they are generally "dark brown, with a reddish under-tone," in colour.

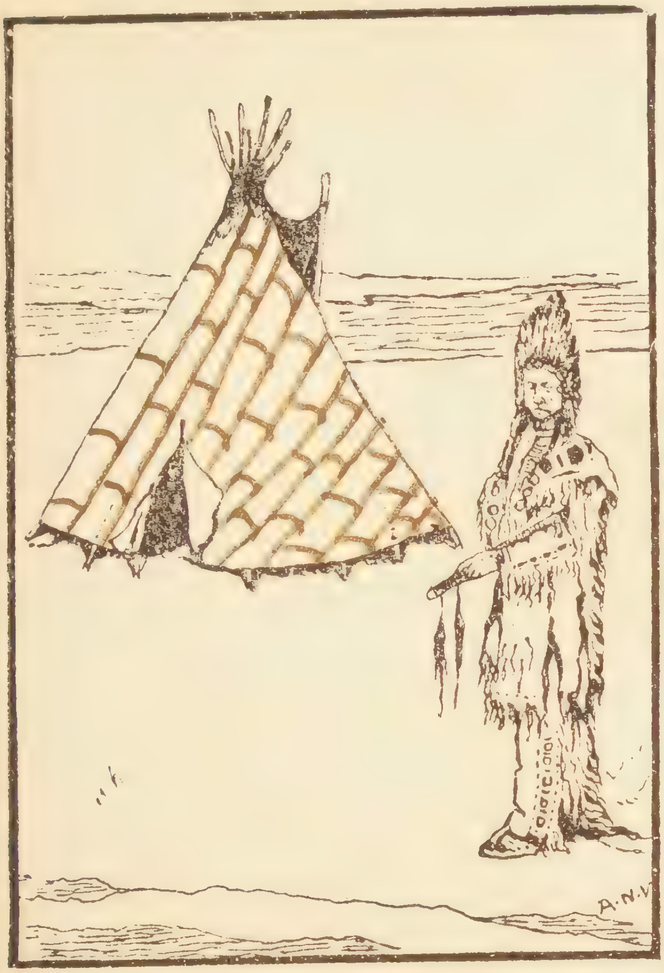


FIG. 32. The Indian and his Wigwam.

They are fairly tall, and their hair is long, coarse and black. Their eyes are deep-set and black, nose prominent, mouth large with a massive lower jaw and face almost beardless. They are vain and often make themselves gaudy by means of feathers, beads, claws and paint.

When North America was discovered some tribes were savage and others had reached a state of civilization. The savage Indians lived by hunting and fishing while the more advanced raised "Indian Corn" or maize and tobacco. They had no settled homes, but roamed about. They lived in skin tents pitched in a group and forming a village. The women and children spent their time in the villages, while the men fished on the lakes and rivers or along the seashore, and hunted in the forest or on the prairies. Before the coming of the whites, hunting was done on foot as there were no horses in the continent. When horses and guns were introduced by white men, the Indians began to hunt the vast herds of bison in larger numbers and the animal decreased in number at a very rapid rate. Besides the bison, the antelope, the wapiti and the caribou were also hunted. These animals furnised them meat, leather and furs for clothing, rugs, bedding and tents. Had there been such domestic animals as the horse, cattle and sheep, the Indians would have probably led a settled life. The savage Indians knew the use of pottery and had tools and weapons of stone. In Mexico, Central America and south-west United States, the Indians were more civilized.

The most noted among these Indians were the *Aztecs.* They occupied the city of Mexico and some of the neighbouring country. They mined silver and gold, wove blankets and ornamented their pottery and their buildings. They had fine cities, well-built roads, aqueducts and reservoirs. They had no domestic animals and, probably on this account, they practised cannibalism. The Aztec empire was conquered by Cortez in 1521. Compare the empire of the Incas in South America.

In the north of Mexico and in New Mexico and Arizona, U. S. A., live the Pueblo Indians leading almost the same kind of life as they did four hundred years ago. This region is arid and therefore Europeans have avoided it just as they have avoided the barren lands of the Eskimos. The Pueblo Indians live in large flat-roofed houses of *adobe* (sun-dried mud-brick), often built on the flat tops of the *mesas.* In some cases these houses are entered from the roof by means of a ladder. They were intended as strongholds against the attacks of wandering tribes. Besides these there are Indians residing in dwellings built on the sides of cliffs under over-hanging ledges and in caves dug out of the rocks.

Indian Reservations: The Indians were driven from their hunting ground by the settlers as they advanced westwards ; and their resentment towards the whites led to many a massacre. But in the end they were outnumbered and conquered. In Mexico and Central America the Spaniards and Indians have become mixed up by intermarriage, but in Canada and the United States the Indians are confined to certain regions called *Reservations* that are under government control. Canada has nearly 100,000 Indians, and the United States about three times as many. The Indian Reservations lie scattered over central and western North America, and the largest is "Indian Territory" north of Texas, U. S. A.

The object of the government is to encourage the Indians to adopt civilized customs and to take to farming. The attempt has in many cases failed owing to the inherent laziness of the Indians and the dishonesty of the Indian agents. Moreover, the farms given are not always good.

(3) **The Negroes:** These are descendants of the slaves who were brought from Africa to work on the cotton, sugar, tobacco and rice plantations in the southern and south-eastern states. There are at present more than 10 million negroes in the United States, and they form nearly 10 per cent of the total population. The Civil War of 1861-5 brought about the abolition of slavery; but the position of negroes is still held to be lower than that of the whites. They are not allowed to travel in the same railway carriages, to attend the same churches, or to be taught in the same schools. Many of the negroes have received education, and have become successful teachers, preachers, doctors, lawyers and bankers for their own people. Still they are treated with contempt by the whites, and there have been cases of horrible murders of 'blacks' by the whites. There are also large numbers of negroes in the West Indies.

(4) **Descendants of the early European Settlers:**

The Spaniards: Not long after the voyage of Columbus, the Spaniards began to conquer and settle in Central America and the West Indies. Mexico was soon conquered and, as the part of the continent where they settled was narrow, they easily crossed it and explored the Pacific coast also as far north as San Francisco. San Francisco, Sacramento, Sierra Nevada, etc., are some of the names given by the Spaniards. The Spanish conquests were marked by cruelty and deceit. Many of the natives were killed and others enslaved. As the Spanish soldiers and merchants increased in number, they intermarried with the Indians.

The French: These were first attracted by the fishing on the Newfoundland banks. They settled in the St. Lawrence basin where the fur trade was profitable. They explored the Mississippi and, taking possession of its valley, wanted to hold it by a chain of trading posts and forts. But they were forced to abandon their claim when their forts at Pittsburg and Quebec were captured by the English in 1758 and 1759. There is still, however, a large French population in Canada, especially in the province of Quebec. New Orleans, St. Louis, Lake Champlain, Louisiana, etc., are names given by the French.

The English settled along the east coast, and soon extended their settlements from Florida to Nova Scotia. These British settlers became powerful enough to declare their independence of the British Government in 1776. This was the foundation of the United States which rapidly acquired and added to the Atlantic States the lands stretching westward to the Pacific.

Immigrants: The population of the United States at the beginning of the 19th Century consisted only of 4 million white people; in 1920 it was about 95 millions. This enormous increase is largely due to the constant stream of immigration from Europe. These immigrants have come not only from the British Isles, but also from Germany, Italy, Russia, Sweden, Norway, Austria and

Hungary. There has been a steady immigration into Canada also. Some *Chinese* and *Japanese* have settled in California and British Columbia; further immigration of these people has been stopped by legislation.

DISTRIBUTION OF POPULATION (Fig. 33.)

From the map you will see that the *most densely*

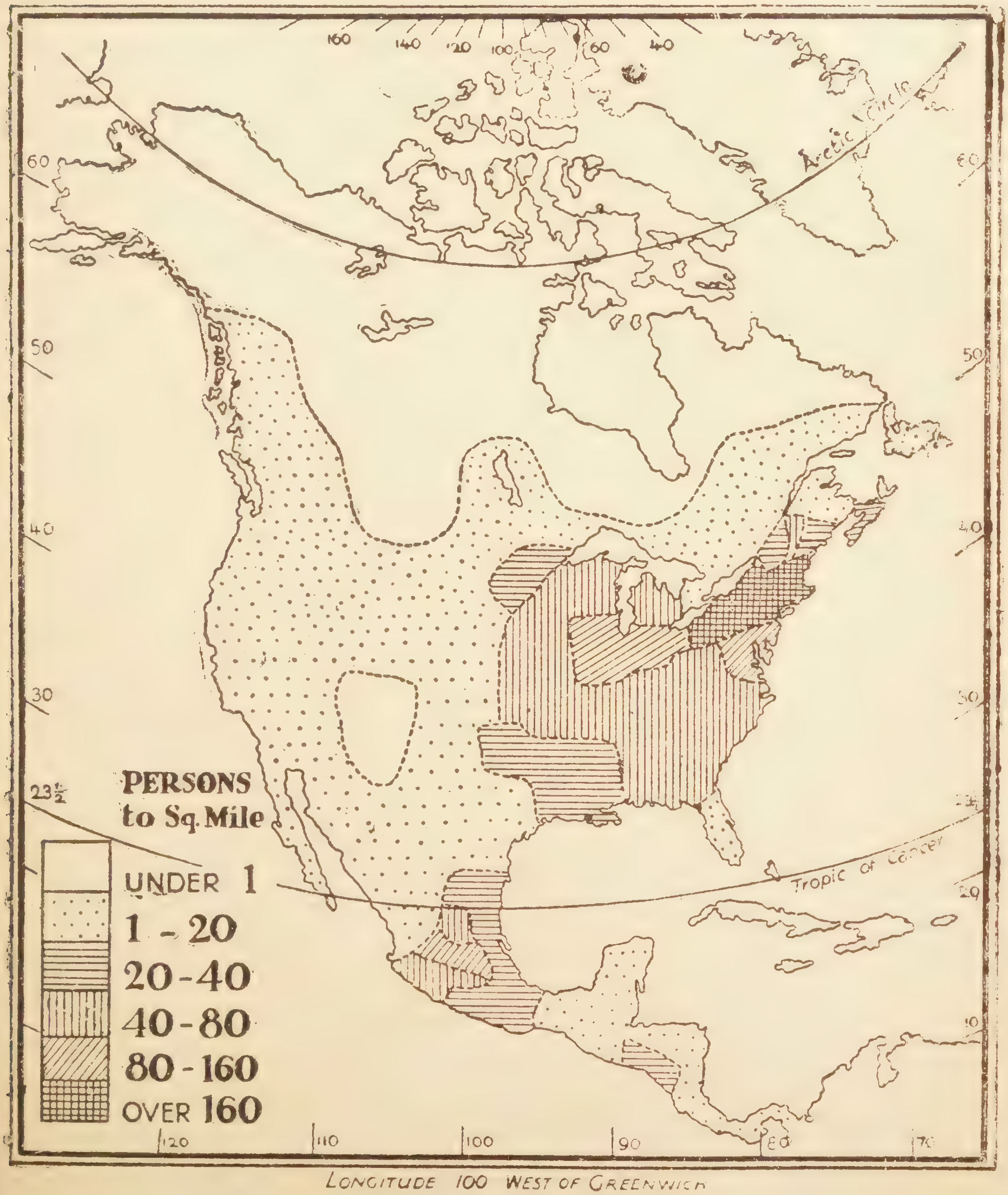


FIG. 33. Distribution of Population.

peopled part of North America is the belt of states in the latitude of New York, from the Mississippi to the Atlantic Coast. Here are the chief industrial and commercial centres. The agricultural and stock-raising areas of the Central Plains support a moderate population. Somewhat dense population occurs round Mexico city in southern Mexico, where temperature is moderate, and also along the coastal belts of Central America and West Indies where cultivation is possible.

In the Cordilleran region (except California and Washington) and on the high plains the population is thin, for the former is mountainous and the latter is used only for stock-rearing.

The Scantiest Population occurs in the frozen barren lands of the north where the Eskimos have to struggle hard and long against the forces of nature for their very existence.

The area of Canada is about 4 million square miles and the total population is very near 9 millions, so that the density of population is only 2 per square mile. This is due to the fact that much of the country is taken up by the barren lands and forest. Compare with Australia. More than 5 million people live in the two provinces of Quebec and Ontario. Only about 5 millions of the people are of British stock. The area of the United States is about 3 million square miles and the population in 1926 was estimated to be 120 millions.

POLITICAL DIVISIONS

There are three political divisions in North America: (1) **The Dominion of Canada** and **Newfoundland**, (2) **The United States and Alaska,** and (3) **Mexico.**

Look at the boundaries between these divisions. The boundary between Alaska and British Columbia is not a natural boundary; except in south-east Alaska, it is a line of longitude. Between Canada and the United States, the boundary, from the west-coast to the Lake of the Woods, is the parallel of latitude 49° north. East of the lake it is a water boundary, and in the extreme east it is an arbitrary line. Between Mexico and the United States the boundary is for 900 miles the Rio Grande, and in its western part it is an arbitrary line.

The Dominion of Canada, a self-governing British Colony, was formed in 1867 with its capital at *Ottawa.* **Newfoundland** did not join the Dominion, and is therefore an independent colony with the coast of Labrador dependent upon it. Canada is made up of nine provinces and two territories (Yukon and North-west). The provinces have responsible government of their own, and the Dominion Government which meets at Ottawa controls all matters which affect the Dominion as a whole. Compare Australia.

In the **United States** there are now 48 states in addition to territories which have not the rank of states. The government is a Republic, the head of which is a President elected every four years. The capital of the whole country is *Washington* which stands in a small area (the District of Columbia) which belongs to no state. Compare Canberra of Australia. **Alaska** in the north-west and **Porto Rico** in the West Indies are possessions of the United States.

Mexico is a Republic like the United States, but the government has not been satisfactory, and there have been repeated resurrections and civil wars. The capital is *Mexico City.*

Greenland belongs to Denmark in Europe.

EXERCISES

(1) Illustrate from the life of the Eskimo and the Red Indian that the life of primitive man depends entirely on his environment.

(2) Write short notes on : the Aztecs ; the Pueblos.

(3) What are ‘ Indian Reservations ’? What is the object of the government in having these reservations ? How far has their object been gained ?

(4) How did the negroes come into North America ? In which part of the continent are they to be found in large numbers?

(5) Explain : “ The population of the United States is of very mixed origin.”

(6) Account for the thin population of Canada.

(7) Where is population densest in North America ? Why ?

(8) Draw rectangles to show the relative areas of Canada and U. S. A., and mark therein their relative population by means of dots.

A. L. RamaNathan.

CHAPTER VII

THE UNITED STATES

When a country is so large that it has different physical and climatic features in its various parts, it is better to divide it into sections in order to study it in detail. The United States can be divided into five sections: (*a*) The North-eastern Industrial and Commercial Region; (*b*) the South-eastern Plantation Region; (*c*) the Central Farming Region; (*d*) the Cordilleran Region; and (*e*) the Pacific shorelands. We shall study what each region produces and what use man makes of these products.

The productions of a country depend chiefly on the fertility of its soil; and if, in addition to this, the country possesses a good supply of *coal* and *iron*, it is able to carry on manufacturing industries, and becomes a prosperous country. In fact coal, iron and a fertile soil form "the tripod upon which modern civilization rests." In addition to coal and iron, the United States possesses a large supply of *petroleum* and *natural gas*. (Fig. 34.)

The Chief Coal-fields are:— (1) The Appalachian Coal-fields from Pennsylvania to Alabama, the most important coal-producing area of the country; (2) the Michigan Coal-field; (3) the East Central Coal-field lying between the Mississippi and the Ohio; (4) the West Central Coal-field, lying west of the Mississippi extending from Iowa to Arkansas; (5) the Texas Coal-field; (6) the Rocky mountain area containing isolated fields; and (7) the Pacific-slope Coal-fields of California, Oregon and Washington.

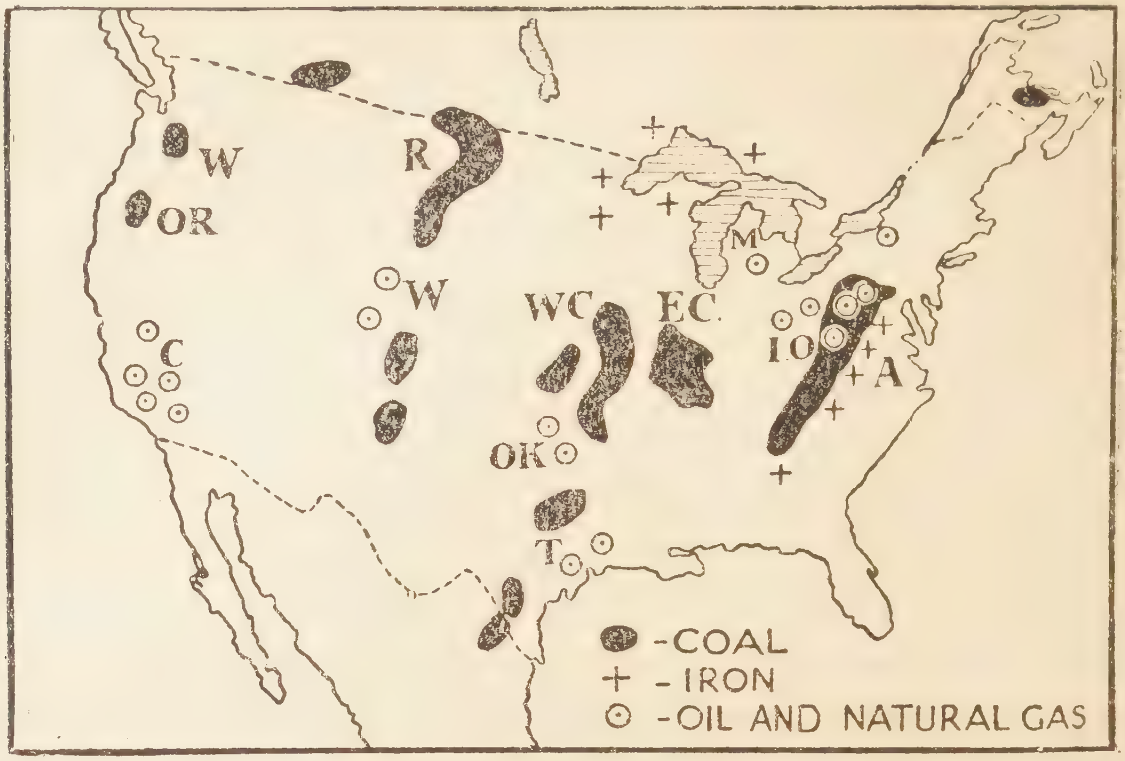


FIG. 34. Coal, Iron, Petroleum and Natural Gas Fields of the United States.

Coal-fields :—
- A-Appalachian C. F.
- M-Michigan C. F.
- E-C-East Central (Illinois)
- W. C-West Central Iowa, (Missouri)
- T-Texas C. F. R-Rocky Mtn C.F.
- O. R-Gregon C. F.
- W-Washington C. F.

Oil-fields :—
- A-Appalachian O. F.
- I. O-Indiana, Ghio O. F.
- O. K-Oklahama O. F.
- T-Texas O. F.
- W-Wyoming O. F.
- C-California O. F.

Iron is widely distributed, but the chief iron-producing states are Minnesotu, Michigan, Alabama and Pennsylvania. Of these the first two are in the Lake Superior region. Here an ancient mountain area has been worn down to low hills so that the rich ore deposits are laid bare. The ore that is best suited for the production of steel is mined in Lake Superior and Alabama districts. Iron can be profitably extracted from the ore where there are coal and limestone near. The coal is used for smelting and the limestene is used as a *flux*.

Petroleum and Natural Gas: These, like coal, result from changes which have taken place in organic matter long buried under the surface of the earth and subjected to great pressure. The chief oil-fields are in western Pennsylvania and New York, in Ohio, Texas, Oklahama and California. Great "pipe-lines" convey the oil to a coal-field for refining and to the ports for export; 'tank-cars' carry it by rail to all the towns of the states, and 'tank-steamers' take it across the ocean to Europe and Australasia. There are numerous pipe-lines from the Pennsylvania coal-field to the ports on the east-coast. Some of the useful products of petroleum are kerosene, lubricating oil, petrol, naphtha and paraffin, from the last of which vaseline is manufactured.

Associated with petroleum is natural gas which is conducted from the gas wells through pipes to factories for heat, power and lighting. The ports on Lake Erie use gas from West Virginia.

In the Western Cordilleran Ranges occur large supplies of gold, silver, lead, copper, zinc and quicksilver.

(*a*) **The North-Eastern Industrial and Commercial Region**: This includes New England and the Mid-Atlantic States of New York, New Jersey and Pennsylvania. These form the busiest and most densely populated part of North America. Why?

The early industries were agriculture, lumbering and fishing; but agriculture was not successful on account of the poverty of the soil. The timber of the forest and the natural harbours led to *ship-building*. Later on *manufactures* developed because of (1) the abundance of water-power, (2) the nearness of the Appalachian coal-fields, and (3) the facility for getting raw materials from the south and from foreign lands. Coal and iron, mind are found side by side. It is facing Europe. The lakes offered convinient water ways:— Who are by Nature Industrius:—

imp.

The water-power along the "fall-line" led to the establishment of great *textile industries* at such places as *Manchester*, *Fall River* and *Lowell.* Cotton comes from the southern plantations and wool from the ranches of the High Plains. Fall River is the chief cotton town because it has abundant water-power, water transportation and a moist climate favourable to cotton-spinning. *Boot and shoe-making* is carried on in a number of cities. Hides come from the west and the bark of the oak and hemlock is used for tanning.

The Metal Manufactures are those that require little raw material but highly skilled and specialised work; for coal and iron are not found in New England, but have to be brought from the mines of Lake Superior or the Appalachian coal-fields. Thus articles such as clocks, watches, jewellery and firearms are manufactured. At *Waltham*, near Boston, the American Watch Company produces more than 2,000 watches every day.

Other industries are fruit-farming, dairy-farming, lumbering and fishing. Maine has huge saw-mills, pulp factories and paper mills at *Augusta* where falls provide cheap motive power.

Boston (748,000), the capital of Massachusetts, is the largest town. It is the chief sea-port of New England and is second to New York in importance as a port. It is itself a manufacturing town, engaged in several kinds of manufactures, especially of clothing. It receives raw materials to be distributed among the factories and finished goods to be shipped all over the world. Many railway lines connect the city with the other parts of the Sstates. Boston is one of the greatest intellectual centres in America. Its suburb of *Cambridge* is famous for the Harvard University.

The Mid-Atlantic States owe their present development of manufactures to the large supplies of coal, iron and petroleum. They have also aboundant water-power and magnificent harbours. The iron and steel industries of this area are the most important in America.

Pittsburg (588,000), the great centre of this industry, stands on the Ohio. Every year hundreds of thousands of tons of good ore are smelt here. The ore is brought from the mines of Lake Superior down the lakes to *Cleveland*, and then by rail to the manufacturing centres. Almost every city in the Mid-Atlantic States is engaged in iron work of some kind. *Buffalo* manufactures machinery and car wheels, deriving power from the Falls. In New York city almost all kinds of iron goods are made. Great steel ships are constructed in the shipyards of *Philadelphia*. *Detroit* is famous for motor cars.

Trenton on the "fall line" is the biggest china and pottery centre. Every great city has textile industries of some importance. Philadelphia specialises in carpets and woollen goods.

Dairy-farming, lumbering and fishing are other industries. The oyster fisheries of Chesapeake Bay are important.

New York (5,620,000) is the second largest city in the world and the most important port in America. It has a splendid natural harbour at the mouth of the Hudson protected by Long Island. Its importance is due to its position at the seaward end of the Mohawk—Hudson gap which provides a natural route to the interior. Look again at Fig. 5. From Albany on the Hudson the Erie Canal to Buffalo and the Champlain Canal to Lake Champlain give water communication between New York and the Great Lake and the St. Lawrence. These routes are also followed by railways. The world's sea-routes converge upon New York, and hence nearly half the commerce of the States passes through it. It is also a great manufacturing city with great textile and iron factories. Limited space in the city has led to the erection of '*sky-scrapers*,' buildings 20 to 30 storeys high. The Woolworth Building is 750 ft. high and has 55 storeys.

Philadelphia (1,824,000), the capital of Pennsylvania, is a natural outlet for the coal, iron and steel industries of the State. It is on the "fall line" and at the tidal limit of the Delaware. It is a great industrial centre, the chief manufactures being machinery and steel ships including war ships. It is connected with Pittsburg on the Ohio by lines crossing the Appalachians.

(*b*) **The South-eastern Plantation Region:** This includes the southern part of the Atlantic plain and the coastal plains of the Gulf of Mexico as far as Texas. The climate of this region is everywhere warm and rainfall is abundant. Hence cotton, tobacco, rice and sugar-cane are raised. In south Florida where the climate is tropical, oranges, lemons, pineapples and bananas are grown. The main occupation is agriculture.

The whole area can be divided into three regions, *i. e.*, The *tobacco region*, (2) the *cotton region*, and (3) the *rice and sugar* region.

The tobacco region centres round Virginia and Kentucky. Louisville (Kentucky) and Petersburg are manufacturing centres, and Richmond and Baltimore (734,000) are outlets. Which of these towns lie on the "fall line"? On a small coral island south of the Florida Peninsula lies Key West which has also tobacco factories, for it is near Cuba which is famous for its tobacco.

The cotton region includes the States of North and

South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Texas and Oklahoma (Fig. 35). These states correspond to the Cotton Belt in Fig. 36. Along the coastlands long-fibred *sea-island* cotton is grown, while the interior produces short-fibred *upland* cotton. More than half the world's supply of cotton is produced by the United States; and nearly half of this is exported to Lancashire (England). After 'ginning', the cotton is pressed into bales weighing about 500 lbs. each and shipped. The seeds are crushed for oil used in soap-making and the oil-cake is used for the feeding of cattle, and also as fertilizers.

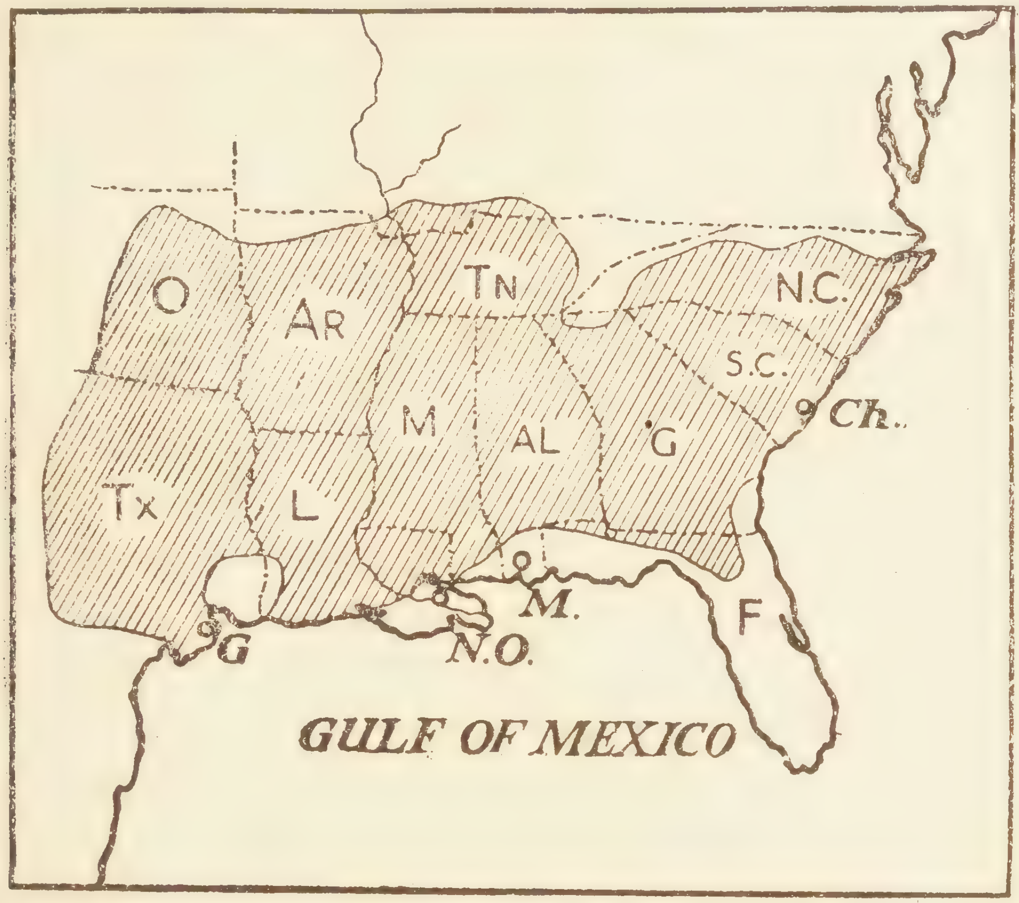


FIG. 35. The Chief Cotton-producing States of N. America.

Cotton mills were first set up along the "fall line", *e.g.* at *Augusta*, *Macon* and *Columbia* (Fig. 7.) Other centres grew up on account of the supplies of coal and machinery from the southern Appalachian region. The chief cotton ports are *New Orleans, Galveston* and *Mobile* on the Gulf Coast, and *Charleston* and *Savannah* on the Atlantic Coast.

New Orleans (390,000), the largest city in this belt is the chief outlet for the Mississippi which is a great highway of commerce. It has water communication with the towns situated on the Mississippi and its tributaries. Railways from the north, west and east converge upon it.

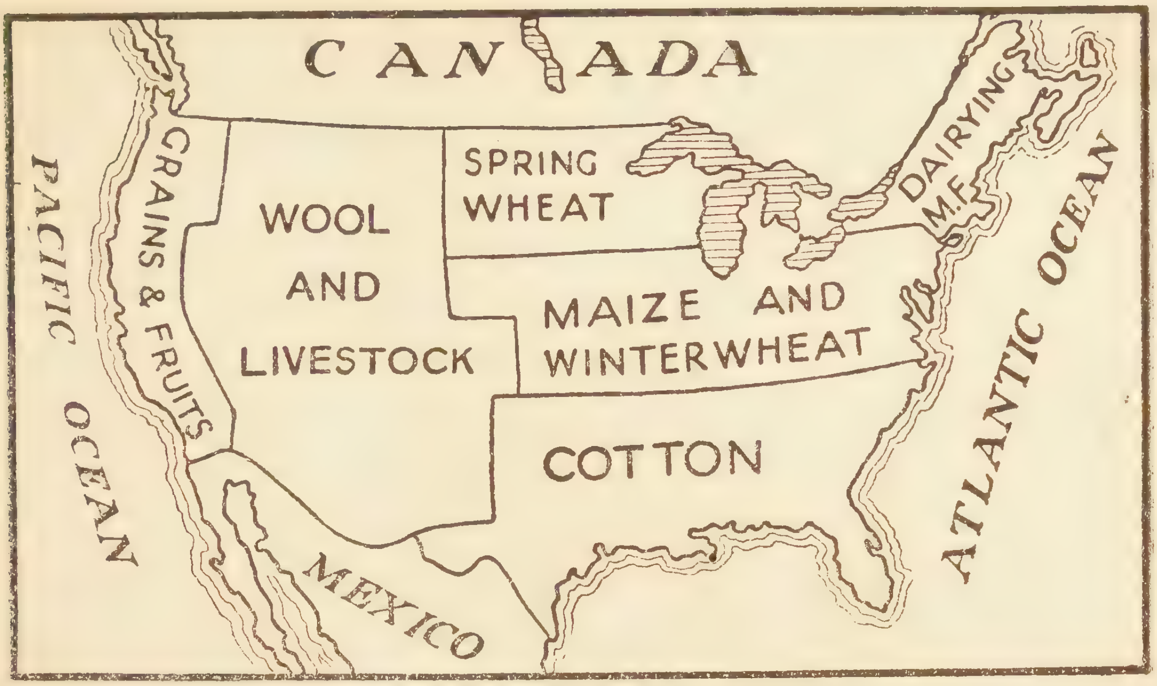
Rice and sugar are chiefly cultivated on the low coastal plains, the former from the Carolinas to Texas and the latter on the flood plains of the lower Mississippi in Louisiana. New Orleans, being in the midst of sugar plantations, has large sugar refineries.

Lumbering is carried on in the uplands and in the pine forests of Georgia ; but the method of lumbering is somewhat different from that in New England. Instead of floating the logs down the streams to the saw-mills, the saw-mills are located in the midst of the forests.

The leading manufacturing centre is *Birmingham* (179,000) in Alabama. It is at the southern end of the Appalachian coal-field and iron ore of good quality is obtained. Hence, in this city, as in Pittsburg, iron is extracted and steel and other useful articles are manufactured.

(*c*) **The Central Farming Region** (Fig. 36.): We have already stated that the central plains east of the meridian 100° W. have more than 20 inches mean annual rainfall, and are therefore fit for cultivation. This productive area is divided into three belts:—(1) The Wheat Belt ; (2) the Maize or Corn Belt ; and (3) the Cotton Belt.

The Wheat Belt lies north of 43° N. Lat. The long, warm summers and the rich prairie soil make the region a very fine grain-land. This is a continuation of the



M.F. = *MIXED FARMING*

FIG. 36 Productive areas of the United States showing predominant Industries.

Cotton, Maize & Wheat Belts. Maize is also cultivated in some parts of the Cotton Belt

Canadian wheat area, and the best wheat-lands are in the Red River valley. Oats and barley are also largely grown in this belt. This is called the "Spring Wheat" Belt, for, as the winter is severe, the grain is sown in April or May, and harvested in August or September. The largest farm contains 15,000 acres.

The greatest flour-milling centre in America is *Minneapolis* located on the upper Mississippi near the Falls of St. Anthony from which it derives power. *St. Paul* which makes with Minneapolis a great "twin" city stands at the limit of the navigation of the Mississippi and is a great collecting and distributing centre for the smaller town in the vicinity.

The chief outlets for this belt are *Duluth* and *Chicago*. The former on Lake Superior exports not only wheat, but also timber and iron. The latter is on Lake Michigan and is an important shipping point for grain. These ports have several *elevators* where the grain is stored and then transferred to boats, called "whale-backs." An elevator may cost as much as a million dollars.

The Maize Belt: This lies between parallels 43° and 35° N. Lat. This is also the "winter wheat" belt, for the grain is sown in autumn and harvested in the following June and July, but maize is of greater importance than wheat. Maize is sown in May and harvested in September and October. Much of the corn is used for *fattening the swine and cattle.*

The chief towns engaged in the slaughtering of cattle and hogs are *Chicago*, *St. Louis*, *Omaha*, *Kansas City* and *Cincinnati.* The stockyards for cattle, sheep and hogs in Chicago cover thousands of acres. Many of the cattle are brought to these centres from the great ranching area of the high plains in the west. These plains have extensive grasslands where the cattle can remain out of doors all the year round as there is not much snow-fall.

A ranchman may own from ten to twenty thousand head of cattle and these are allowed to roam over long distances. Why? Twice a year there is a *round-up* of cattle. The first is to find the calves that have been born during the winter and to *brand* them so that the cattle belonging to different owners may be distinguished. The second round-up which occurs in autumn is to select cattle, chiefly male, for killing. These are sent by rail to Omaha, Kansas City, St. Louis and Chicago. Thousands of cattle are slaughtered every year in these cities.

No part of any of the slaughtered animals is wasted. Leather, tallow, grease, glue, gelatine, medicinal preparations and fertilisers are the chief "by-products." The great provision centres which are dependent upon live-stock products are to be found in the triangle of territory shown in Fig. 37.

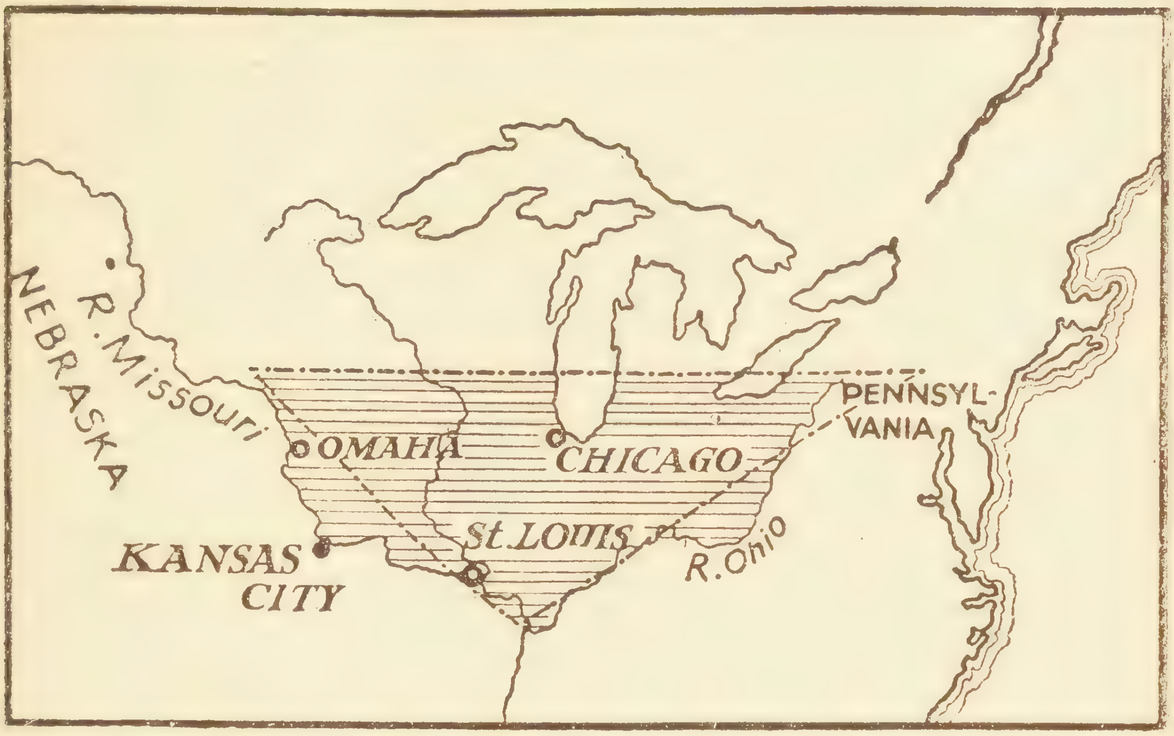


FIG. 37. The triangular territory of the great provision centres depedent on live-stock products.

"The 'triangle' is formed by the Missouri and the Ohio rivers on the sides and on the third by a line reaching from Pennsylvania to Nebraska"—(Spencer Trotter.)

Many coal-fields are found in this belt so that towns like St. Louis, Chicago and Cincinnati which were formerly agricultural and slaughtering centres have now become manufacturing cities.

Chicago (2,702,000) is the second largest city in America. It is situated at the southern end of Lake Michigan where a small river, the Chicago, enters it. Its harbour has been enlarged by the building of breakwaters. The city is connected by a canal with the Illinois, a tributary of the Mississippi, so that it forms an outlet for the upper Mississippi basin. It is near a coal-field and iron can be easily brought from the shore of Lake Superior; therefore it manufactures farm implements, railway stock, machinery, clothing, etc. It is the converging point of all land routes going east and west in the northern states. Now railways radiate from it in all directions.

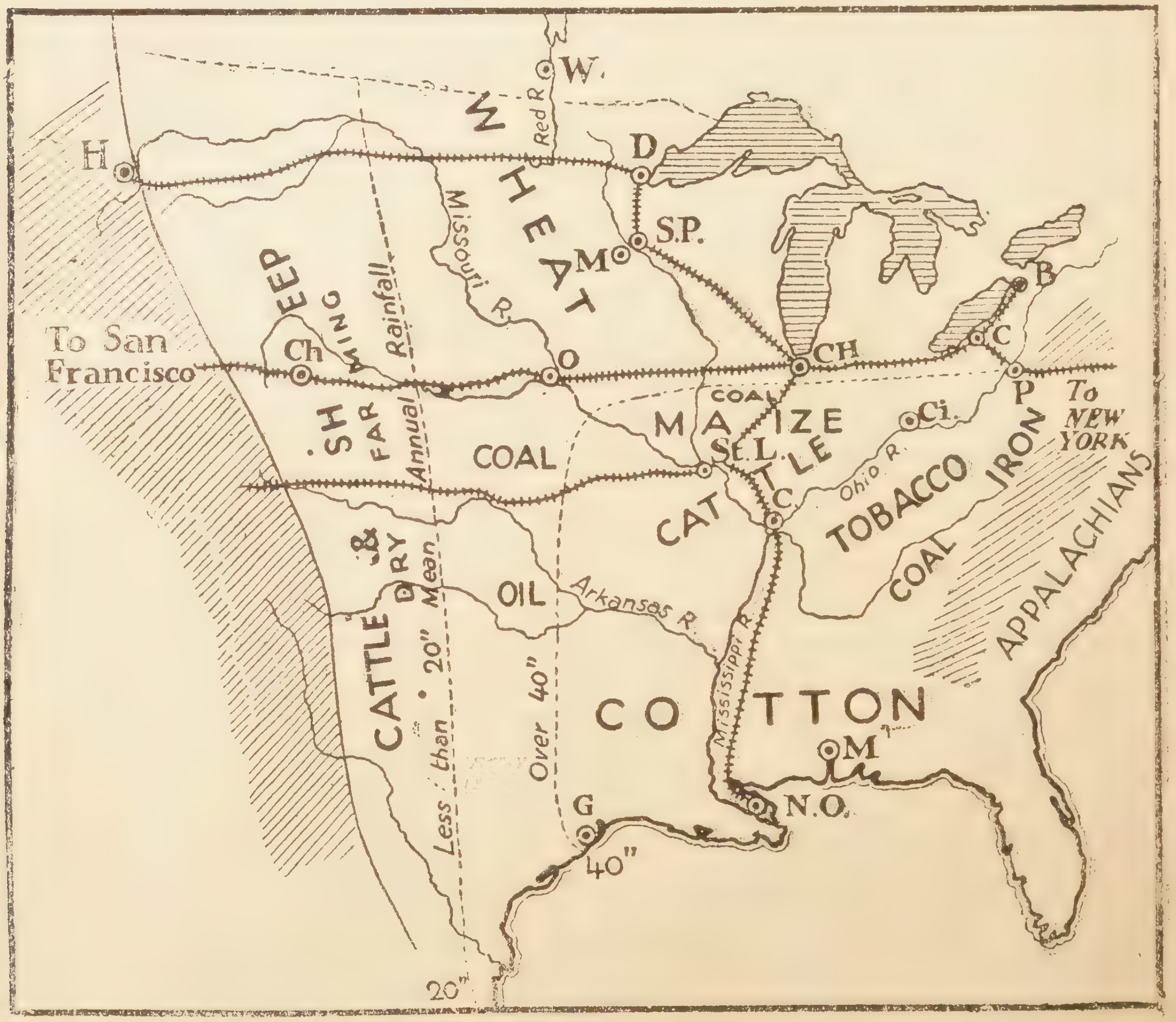


FIG. 38. The Mississippi Basin.
Find out the importance of the position of Chicago (CH) and St Louis (St. L.)

St. Louis (773,000) lies at the junction of the Missouri with the Mississippi and at the centre of a great waterway. Here the river can be bridged, and so it forms an important point on the transcontinental route. Hence it is the meeting point of land and water routes. It trades in the products of the maize belt, and has iron, boot, shoe, meat-canning and tobacco industries.

Cincinnati on the Ohio, is, in addition to its being an agricultural and canning centre, a manufacturing town. Iron and steel, leather and pottery are important manufactures. The *Cotton Belt* has been dealt with under the South-eastern plantation region.

(*d*) **The Basins and Mining Regions of the Rockies:** (Fig. 39). The surface feature, climate and natural vegetation of this region have already been dealt with.

The Great Basin is an area of inland drainage whose centre is the Great Salt Lake. Careful *irrigation* has led to remarkable *agricultural developments* in this region.

Salt Lake City with a population of 118,000 has grown up on the shores of the lake and is connected by railway with San Francisco on the west. In the irrigated areas, wheat, millet and *alfalfa* (a deep-rooted grass) grow well. The great Roosevelt Dam (284 ft. high and 1000 ft. long) on the Salt River (Colorado Plateau) has changed the desert of the river valley into a cotton-growing land. But the most important industry of the Mountain States is *mining.* Gold, silver, copper, lead and iron are the chief minerals found. (See fig. 33 for their distribution). Look at fig. 39. *Denser* (Colorado) and *Virginia City* (Montana) are centres of mining industry. *Butte City* (Montana) has the greatest copper mines; and lead has given rise to *Leadville.*

Transcontinental Railroads cross the Rockies at five places, *viz.*, Helena, Cheyenne, Pueblo, Santa Fe and El Paso. The Northern Pacific Railroad crosses the mountains at Helena, the Union Pacific at Cheyenne, and the Southern Pacific at El Paso.

(*e*) **Pacific Shorelands:** This region includes the coastlands of Washington, Oregon which have rain all the year and California where the climate is of the 'Mediterranean' type.

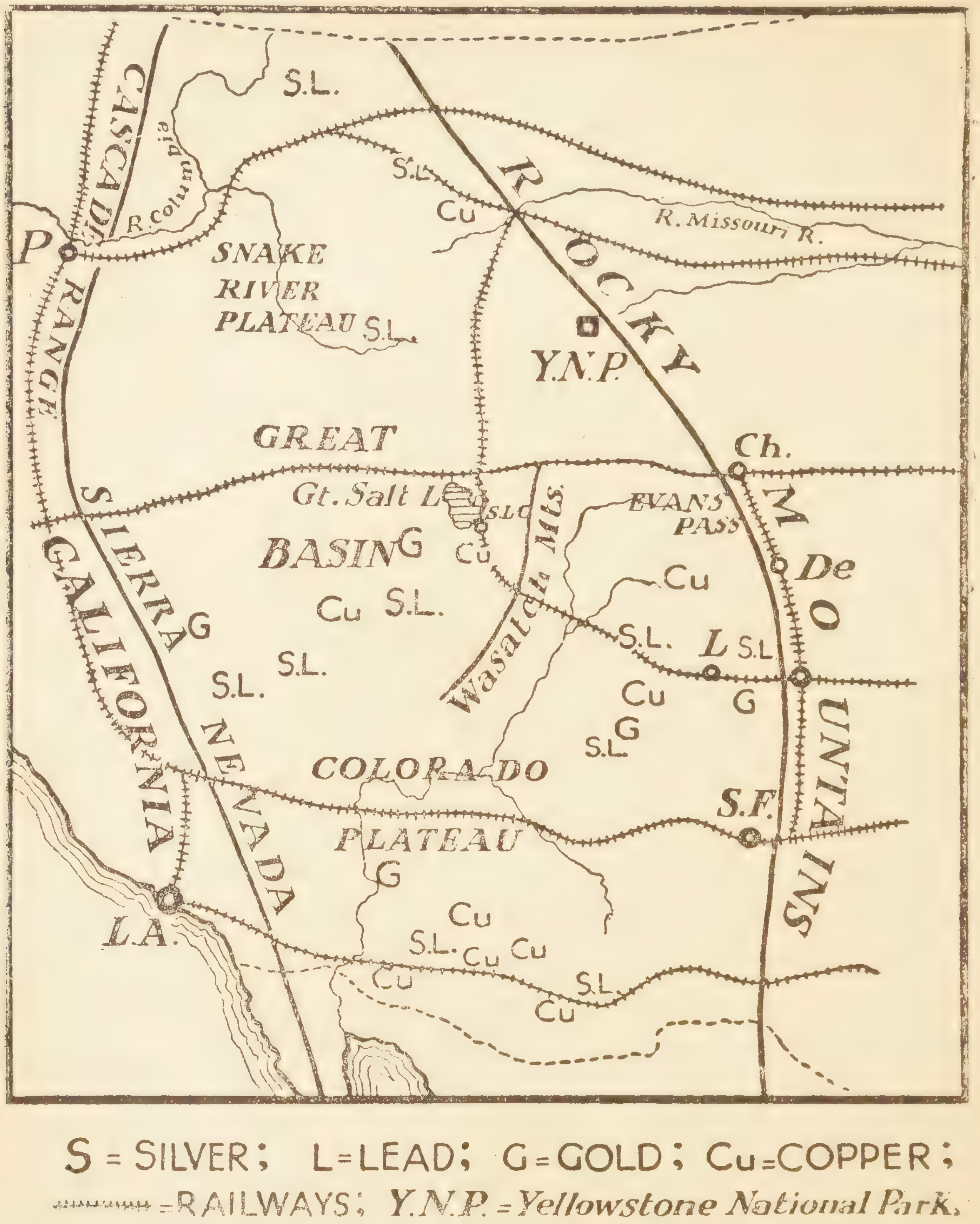


FIG. 39. The Basins and Mining Regions of the Rockies.

Fine timber trees grow on the slopes of the Cascade and Sierra Nevada, and hence *lumbering* is an important occupation. San Francisco, Portland, and the ports of Puget Sound export enormous quantities of timber.

Wheat growing is important in all the three states, and barley is largely grown in California. Sacramento on the San Joaquin is an important flour-milling centre.

Fruit-farming is more important than cultivation of wheat, especially in California. The warm dry summers and cool winters of the California valley are admirably suited to the growth of such fruits as vines, mulberries, oranges, lemons and figs. Large quantities are sent to Chicago and New York in special fruit-cars. In the drier areas of the valley irrigation is necessary, and water for this purpose is supplied by the rivers rising in the Sierra Nevada.

The development of this region had its beginnings in the great 'gold rush' of 1849. *Gold, copper* and *quick-silver* are the chief minerals, water-power and electricity being used for the *mining*. *Petroleum* is obtained in large quantities especially in the neighbourhood of Los Angeles. California is the greatest oil-producing state at present.

Fishing for salmon on the Columbia has led to the fish-canning industry of *Seacttle* on Puget sound.

San Francisco (558,000) is the "Queen of the Pacific Slope". It is situated on the most important natural harbour whose entrance is called the Golden Gate. (Fig. 40). It is opposite to the densely-peopled part of Eastern Asia and looks towards the progressive states of Australia and New Zealand. All the transcontinental railways of U. S. A. converge upon it. Its hinterland, the California valley, is rich in wheat, fruits, metals, oil, timber and cattle. The opening of the Panama Canal has brought the city 6500 miles nearer Europe and 9000 miles nearer by sea to New York. San Francisco has *sugar refineries*, the sugar being obtained from sugar-beet of California and sugar-cane of the Hawaiian Islands.

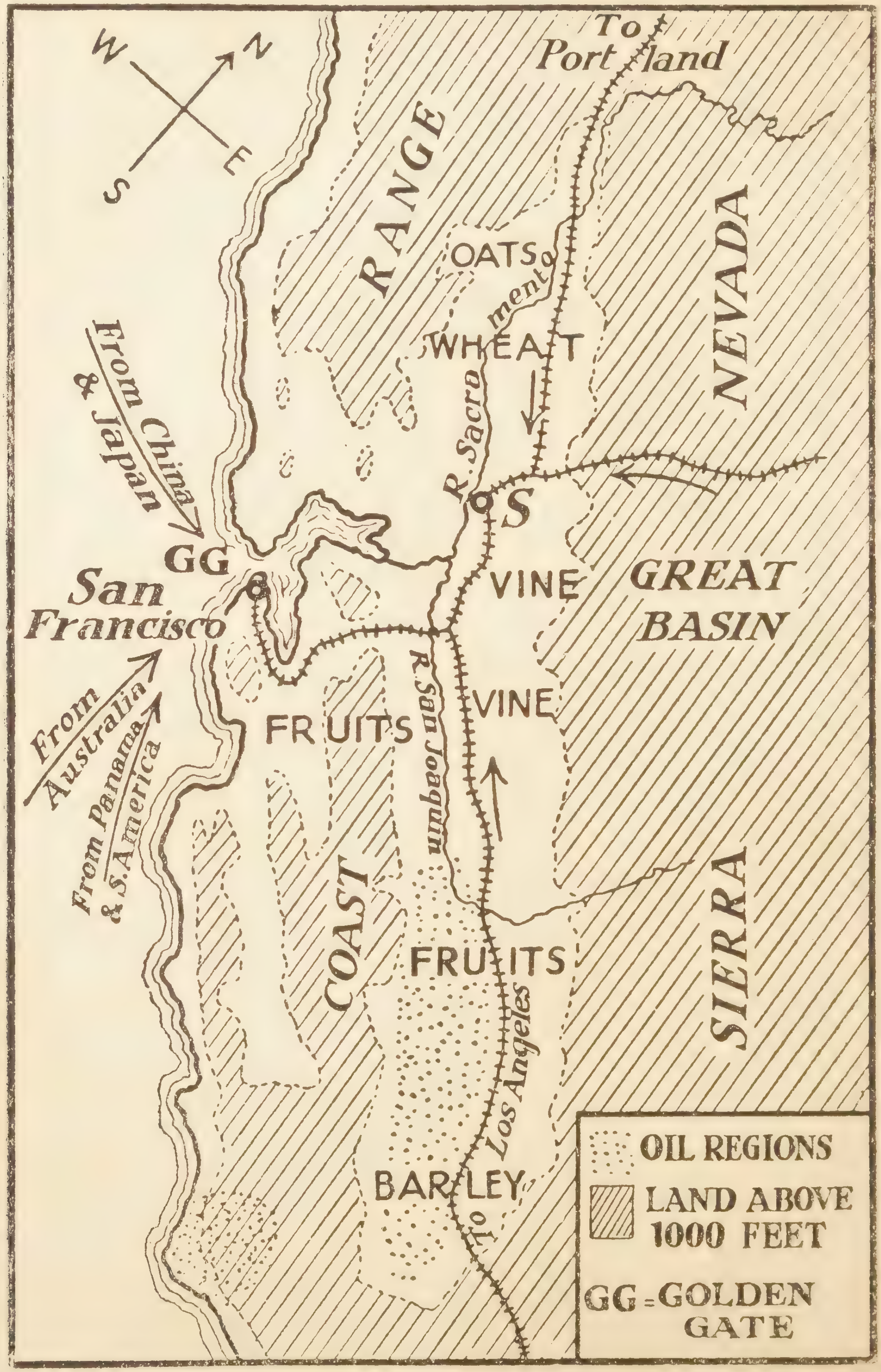


FIG. 40. Position of San Francisco and the Valley of California.

Los Angeles (925,000), the largest city in California, is the centre of a great wheat and fruit-producing region, with valuable deposits of oil. Orange groves are very common, and the city is also noted for the *cinema* industry.

EXERCISES

(1) Why are industrial centres generally located on coal-fields?

(2) Draw a map of N. America showing its coal and oil fields.

(3) Why is Fall River the chief cotton manufacturing town in north-east United States?

(4) (a) "Agriculture is not of one the main industries of New England." (b) "Metal manufactures of New England are those that require little raw material." Why?

(5) What manufacturing industries are carried on in Pittsburg and Philadelphia? Give reasons for the location of those industries there.

(6) Draw a sketch map showing the importance of the geographical position of New York and Chicago.

(7) "More cotton is now used in the factories of the south-eastern States than in the older factories of the north-east." Why is this?

(8) What is a "round-up" of cattle? For what purposes is this done?

(9) What are grain "elevators"? Where are they generally built? Why? Which is the greatest flour-milling centre? Why?

(10) What geographical causes have made San Francisco an important city?

(11) Draw diagrams to compare the populations of New York, Chicago, Boston, Philadelphia, and San Francisco.

(12) Construct a diagram to compare the values of the exports of U. S. A.: Raw cotton, 212 million £; Iron and steel goods, 109 million £: Grains, 107 million £; mineral oils, 89 million £; animal and fish oils, meat and dairy products, 61 million £; cotton manufactures, 30 million £; Wood and wood manufactures, 28 million £; Motor cars, 55 million £; copper and copper manufactures, 34 million £.

CHAPTER VIII

THE DOMINION OF CANADA AND NEWFOUNDLAND

You have already learnt that the Arctic shorelands of Canada consist of *barren lands* or *tundras*, and they are inhabited by a few Eskimos. South of this region lies the great *forest belt* in which we find some Indians and a few trappers who snare and trap the fur-bearing animals for their valuable furs. The bundles of furs are taken by sledge or birch-bark canoe to the trading posts of the Hudson Bay Company. From here they are then taken to the nearest railhead whence they are sent by train to big cities. *Fur-farms* have now been started in Prince Edward Island where animals are reared for their furs.

It is in the southern portion of Canada that all the people have their homes. Even there the population is not dense. In which part of Canada do you find the great railways ? Why ? Can you in any way connect the population of a country with its railway communication ?

× Sea - A87 of Maritime

The populous part of Canada falls into three divisions : (1) Eastern Canada including the† Maritime and Lake Provinces, (2) the Prairie Provinces, (3) British Columbia. Study Figs. 41 and 42 which show the agricultural and mineral regions of Canada respectively.

Imp.

Eastern Canada and Newfoundland: Eastern Canada consists of the maritime provinces of Nova Scotia, New Brunswick, and Prince Edward Island, and the Lake Provinces of Quebec and Ontario. Newfoundland has its own Government and does not form part of the Dominion of Canada. It owns East Labrador. Most of these areas were once covered with forests which have in many places been cleared for agricultural purposes. Large areas of forest still remain in Ontario, Quebec, New Brunswick and Newfoundland.

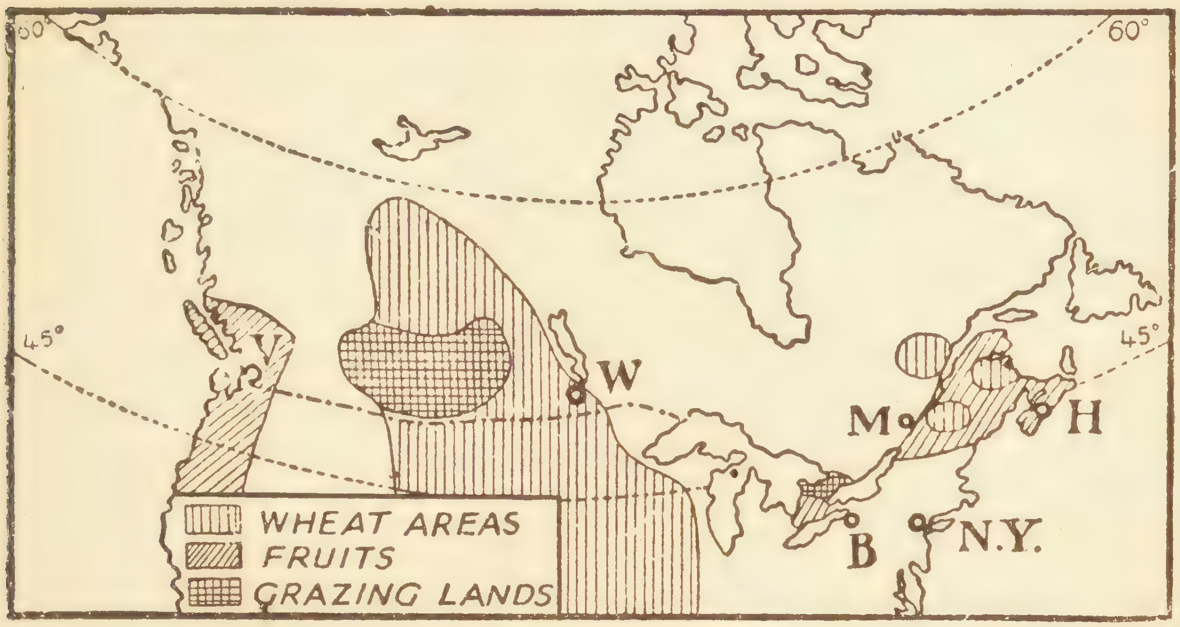


FIG. 41. Chief Agricultural Regions of Canada.

Agriculture is an important occupation in most of the eastern provinces. On the peninsula between Lakes Erie, Huron and Ontario is found the best farm-land in Canada. This is in the province of Ontario, the most populous of the Canadian provinces. Oats, wheat, barley and root crops are grown. The wheat is made into flour, and the oats and roots are used to feed cattle and horses. These are also grown in Nova Scotia and New Brunswick, particularly along the coast.

Imp

Fruit farming: More important than grain is fruit. For the *Lake Peninsula* in Ontario has a rich soil and a warm summer and so it is suitable for fruit-growing.

Apples, pears, plums, peaches and cherries are grown in large quantities. Vine is cultivated along the south-facing shore of Lake Erie.

The *Annapolis Valley* of Nova Scotia is famous for its apples. This valley of apple orchards is about 80 miles long and from five to fifteen miles wide.

Dairy-farming has wonderfully developed in the Lake peninsula and along the St. Lawrence valley, for here the greatest amount of hay is available. Quebec and Ontario have the greatest share in the making of butter and cheese, ✓ and large quantities are exported to Great Britain and the United States. Pigs are also reared here, for they can be fed cheaply on the waste of the dairy farms. In summer the dairy cattle feed on the rich pastures, but in winter they have to be fed on hay, oats and roots, as frosts and snow prevent out-door feeding.

Lumbering is by far the most important industry in Quebec and New Brunswick. Wherever there is convenient water-power huge pulp mills and sawmills have been erected. St. John in New Brunswick has a very big export trade in timber. Quebec is Canada's chief wood-pulp ✓ and paper-making province. The trees are cut down in winter, for the snow provides an easy way of getting the logs to the nearest stream. There the logs are piled up on the ice; and in spring when the streams are free from ice, the logs are floated down to the saw-mills and pulp-mills. The pulp is used in the manufacture of *paper* and *artificial silk.* Newfoundland has extensive pulp and paper mills which supply the newspaper-presses of Britain with paper.

✓**Fishing** is the chief occupation in Newfoundland. The Grand Banks form the most famous fishing ground. These banks are the haunt of millions of *cod* and *halibut* which feed on the sea-creatures living on the banks. These creatures feed on the myriads of tiny floating plants (called *diatoms*) brought down by the Labrador current (Fig. 2). The fishing season begins in early June and lasts until late November. *St Johns* is the capital of Newfoundland and centre of the fishing industry. Curing, packing and extraction of oil are allied industries. The fisheries of Nova Scotia, New Brunswick and Prince Edward Island are also important—cod, herring, mackeral and lobsters being the chief catches. *Halifax* in Nova Scotia has much trade in dried cod, cod-liver oil and canned lobster. *Seal-catching* is also an important industry. It is done when icefloes come down from the north bearing the young seals.

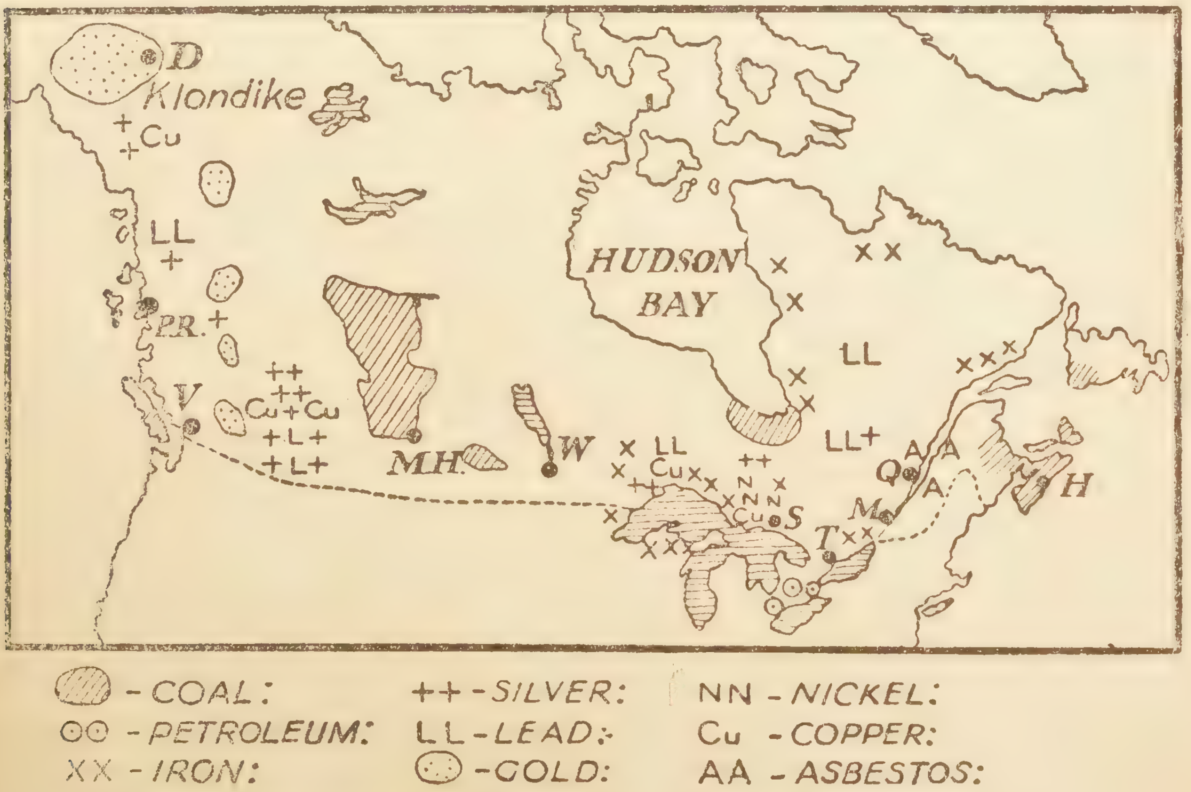


FIG. 42. Minerals of Canada.

Mining (Fig. 42) is important in Nova Scotia which has rich *coal* and *iron* deposits round *Sydney* in Cape Breton Island and round *Picton*. In New Brunswick, iron, copper, silver, lead and gypsum are worked. Quebec produces 8 per cent of the world's supply of *asbestos.* Ontaria has valuable deposits of *iron*, *copper*, *silver*, *cobalt* and *nickel* in the Lake Superior Region. Petroleum is found around *Petrolia* in the Lake Peninsula.

Manufactures: Until recent times Eastern Canada was mainly engaged in *primary* production; but the discovery of minerals has led to the development of manufacturing industries. These manufactures are for the most part carried on in Ontario and Quebec. *Toronto*, *Hamilton*, and *Sault Ste. Marie* in the province of Ontario have large steel-works, iron being obtained from the Lake Superior mining region, and coal from Pennsylvania. Iron and steel industries have been set up at *Sydney* (Nova Scotia) where coal, iron and lime-stone occur together. *Moncton* (New Brunswick) specialises in railway plant. *Leather* industries have been established in *Quebec* and *Fredericton* (capital of New Brunswick). The former is supplied with hides by the cattle ranches of Western Canada and the latter from the cattle pastures on the 'cleared' lands. Both get hemlock bark for tanning from the neighbouring forests. Most of the factories of Eastern Canada are run by electricity made by water power ("white coal") of which there is a vast store in the St. Lawrence and its tributaries and the numerous other streams. Fort William on Lake Superior, Toronto and Montreal have *flour-mills* which get their supply of wheat from the prairie provinces. *Cotton* is manufactured at Quebec, Montreal and Moncton, the raw material being imported from the United States.

Machinery

Towns: Montreal (907,500), on an island of the same name, is the largest city in Canada. It lies at the place where the Ottawa River enters the St. Lawrence, and at the converging point of many water and land routes. See (Fig. 5). The Canadian Pacific Railway runs westward to Ottawa, and eastward to Quebec and St. John. The National Railway links it with Quebec and southwards with Toronto. The Richelieu—Hudson valleys form a direct route between the city and New York. Again, Montreal can be reached by large ocean-going vessels, and its factories are supplied with cheap power by the Lachive Rapids. Hence it has sugar refineries, cotton mills, iron works, tobacco factories and meat canneries. It is the chief educational centre, and has two universities.

Ottawa (107,000) on the right bank of the R. Ottawa is the Dominion capital. It lies at a point where the river is joined by a tributary, and is the chief lumbering centre. Its lumber, pulp and paper mills derive power from its own rivers. Ottawa is connected by a steam-boat canal with Montreal as well as Kingston on the Ontario. The importance of the town will be further increased by the construction of the Georgian Bay ship canal which will connect the R. Ottawa with the Georgian Bay (Lake Huron).

Quebec (117,000), next to Montreal, is the most important town on the lower St. Lawrence. The word means "narrows," for at this point the river is very narrow. Quebec stands at a place where the St. Lawrence is first bridged. It has lost its original importance since the deepening of the river between it and Montreal. It has lumber, leather and cotton industries. It is also a great focus of routes, and is bound to increase in importance as it is the chief eastern terminus of the new National Trans-continental Railway. It is the capital of the province of Quebec.

Toronto (522,000), the capital of Ontario, has an excellent position on Lake Ontario with a good natural harbour. It is the centre for many railway and steamer routes. It has many manufactures including the making of agricultural implements, ship-building, meat-canning, and the making of railway plant, pianos, biscuits and iron-ware.

Halifax, the capital of Nova Scotia, stands on a spacious natural harbour which is ice-free. It is an important winter port and the real Atlantic terminus of the trans-continental railways. It is the chief naval station of eastern Canada and a manufacturing centre.

The Prairie Provinces: These include (1) Manitoba, (2) Saskatchewan and (3) Alberta.

The southern part of this region is drained by the Saskatchewan, Assiniboine and Red Rivers into Lake Winnipeg. The summers are long and very warm, and the winters very cold. But in the provinces of Alberta and Saskatchewan, the winter cold is modified by the warm dry Chinook winds which descend from the Rocky mountains upon the plains. The climate of Manitoba is typically continental. Refer to temperature of Winnipeg.

Agricultural and *Pastoral work* are the two main occupations of the people of the Prairie Provinces. Both kinds of work are carried on in each of the three provinces; but agriculture is dominant in Manitoba, and pasturing in Alberta. In Saskatchewan, the two are equally important.

The late spring and early summer rains help the growth of the young wheat plants, and the long, warm, dry days of late summer make the grain ripen well. The soil of the prairie is very rich and contains no stones. The land is fairly level so that up-to-date machines can be used for farming on a large scale. The very best lands for wheat cultivation are in the Red River valley and in the neighbourhood of Lakes Winnipeg and Winnipegosis in Manitoba. Why? It is easy to construct railways on these level prairies, and the remarkable development of this area is mainly due to the wonderful growth of railways in recent years. Besides wheat, barley, oats, rye, flax, potatoes and turnips are also grown.

Saskatchewan produces more wheat and oats than Manitoba, and its stock-rearing is also more important.

Alberta has long been famous for its stock-rearing, for the warm, dry (Chinook) winds turn the grass into natural hay so that the animals are fed out of doors all the year round. But many of the great ranches have now been turned into grainlands, and large quantities of wheat, barley and oats are grown by means of irrigation and dry farming methods. Still Alberta has the largest number of cattle, sheep and pigs. Horses are also reared in large numbers in all the three provinces, as there is always a great demand for them for work on the farms.

Winnipeg (178,000) the capital of Manitoba and the 'keystone' of Canada stands at the junction of the Red and Assiniboine rivers. It is the "Gateway of the Prairies" and is a great railway centre. It is to Canada what Chicago is to the United States. All railways passing across Canada from the Atlantic to the Pacific must pass through it. From Winnipeg, the Canadian Pacific runs westwards to Calgary, and Vancouver; and the Canadian National to Edmonton and Prince Rupert. Eastwards the town is connected with Port Arthur on Lake Superior, and with Montreal and Quebec on the St. Lawrence. Southwards it is connected with the railways of the United States, and northwards it will be connected with Churchill and Port Nelson on the Hudson Bay (Fig. 43). Winnipeg has rapidly developed into a big

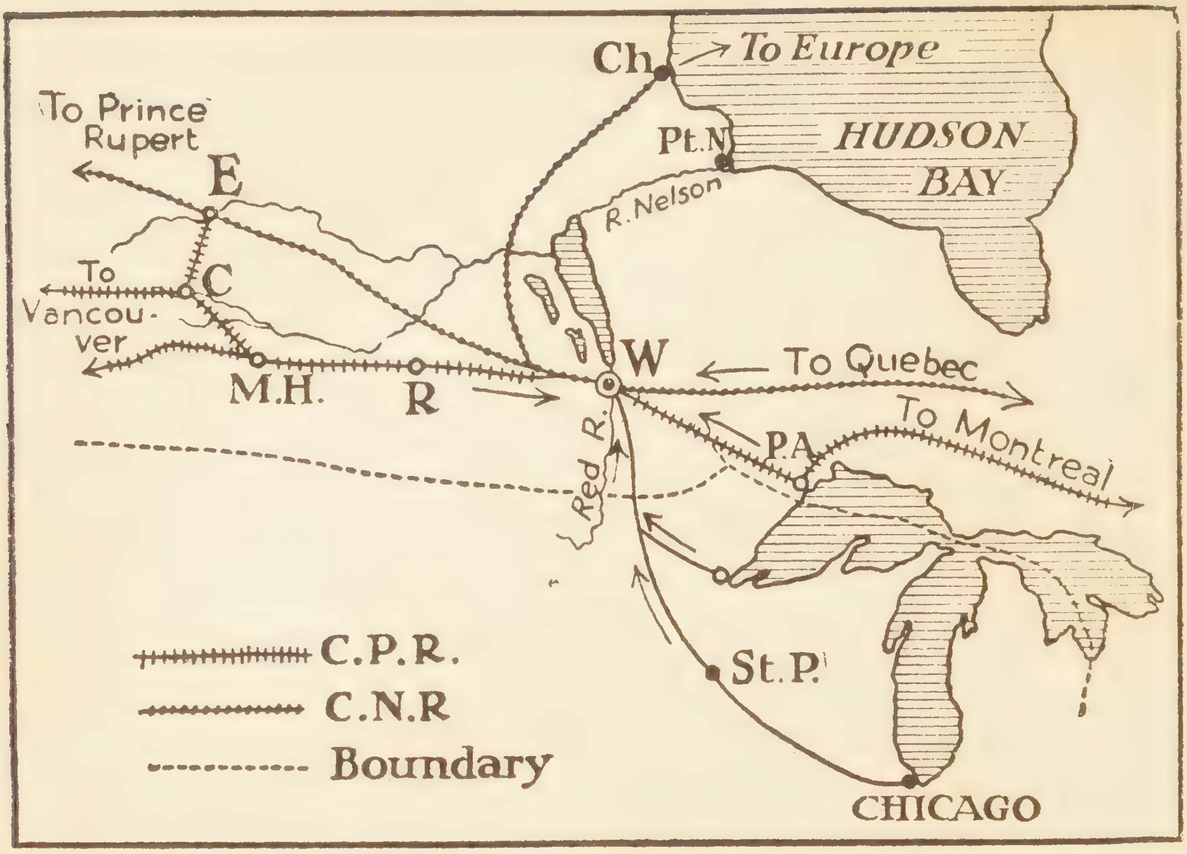


FIG. 43. Position of Winnipeg.

market city from a small Hudson Bay Company fur centre called 'Fort Garry.' All the wheat, barley, oats, rye and linseed from the prairie lands, and the cattle, horses and sheep from the western ranches have first to pass through Winnipeg before they are sent to the eastern ports to be shipped. With the completion of the railway connecting Winnipeg and the Hudson Bay, there will be direct steamship communication with Europe in summer and this is the time when the crop must be mowed. From Port Churchill to Liverpool the distance is only 2926 miles. (Montreal to Liverpool 2887 miles.) This route will save 300 miles of railway transport and so the cost of transport will be reduced. Winnipeg is the chief grain centre and has the biggest wheat elevators in Canada. Flour-milling, leather-making and the manufacturing of farming implements are also carried on.

Regina, the Capital of Saskatchewan, is an important traffic centre on the Canadian Pacific Railway. *Saskatoon* and *Prince Albert* are other towns of growing importance. All these cities are mainly occupied in storing and transporting cereals, and also in marketing cattle and horses.

Edmonton, the capital of Alberta, is a very important railway centre. It stands on the main line of the National Trans-continental Railway, and is connected by a branch line with Calgary on the Canadian Pacific Railway. It stands on a vast coal-field, and is a great cattle-market and meat-packing centre. *Calgary*, on the Bow River, is the centre of a great ranching country, and, owing to irrigation methods, has now become a centre for wheat. *Medicine Hat* has large supplies of *natural gas* which has made it an important manufacturing centre. It has become the chief flour-milling town in the west.

In 1912 the 60th parallel was made the northern boundary of these states, so that an area of forest and land containing minerals was added to each.

✓**British Columbia:** This "Pacific Province" has perhaps more resources than any other in the Dominion. It is traversed by several ranges, and therefore transport is difficult. The seaward slopes of these ranges receive heavy rainfall from the westerlies, and they are clothed with dense forests. East of the Coast Ranges there is a well-marked 'dry belt' (12-20 inches). The Canadian Pacific Railway makes its way over the *Crow's Nest* and *Kicking Horse* passes in the Rockies, and the *Yellowhead* pass in the same range is used by the National Trans-continental Railway whose Pacific terminus is *Prince Rupert.*

✓**Mining** is the oldest industry of the province. Gold was first discovered in 1858 in *Cariboo.* In addition to gold, there are vast stores of silver, copper and lead. Coal is extensively mined in Vancouver Island and in the region of Crow's Nest pass. *Nelson and Rossland* are important mining towns in S. E. Kootenay.

Lumbering is next in importance to mining. There are abundant streams for log transport, and numerous falls for water power. The Douglas fir is the most important of the timber trees. The best market for the timber is in the Prairie country and Eastern Canada. Much of the timber is exported to China, Japan, South America and Australia. Lumbering, sawing and pulping can be carried on all the year round. *New Westminster*, near the mouth of the Fraser, is an important lumbering centre.

Fishing is another important industry. Immense quantities of *salmon* are caught annually in the rivers and among the fiords. Salmon live in the ocean, but come to the rivers every year in order to lay their eggs. They even leap many feet in the air to cross the waterfalls. Whilst travelling up the river, they are caught by various means. The chief rivers noted for their fisheries are the Fraser and Columbia. The *salmon-canning* industry, especially at New Westminster, employs a large number of people, chiefly Chinese, Japanese and natives. Prince Rupert is the centre of an important *halibut* fishery.

Fruit-farming in the warm valleys is the characteristic agriculture of British Columbia. Peaches, apples, plums, grapes and other fruits are raised in large quantities and exported. The dry belt (Okanagan valley) is the chief producing area. Wheat, root crops and tobacco are also grown. The upland pastures support herds of cattle and droves of horses. Dairy-farming and poultry-rearing are becoming important.

The fruit valleys of British Columbia have long dry summers; so the orchards are supplied with water by irrigation. Huge dams are built across streams and at the ends of lakes to store up water. From these reservoirs water is led down to the fields by means of wooden pipes, ditches made of cement or metal troughs. The fruits, tinned salmon and timber of British Columbia are sent to Britain and other parts of Western Europe from Vancouver by way of the Panama Canal. Why?

Victoria, on Vancouver Island, is the capital of British Columbia. It has a splendid harbour, and is the head-quarters of the Canadian fur-sealing fleet. Coal and iron are found near the city.

Vancouver (117,000), on the mainland, has one of the best harbours in the world. It is the largest city in the province, and forms the Pacific terminus of the C. P. R. It trades with the other western ports of America, the ports of China, Japan and India and also with Australia.

Trade of Canada: The following table shows the exports and imports of Canada, the figures referring to an average of recent years:—

Exports	Million £	Imports	Million £
Wheat and flour	69·0	Iron & steel goods	45·3
Wood, pulp, paper etc.	52·4	Textiles (cotton, wool and silk)	43·6
Animals and animal products	36·8	Coal	18·3
Iron, steel goods and machinery	16·7	Sugar	16·8
Metals other than iron	11·0	Fruits	7·5
Fish	5·0	Petroleum	7·3
Fruits	2·0	Drugs, chemicals, &c.	7·0
		Wines and spirits	4·6

The table shows that the exports are mostly raw products as in the case of Australia, the only exception being iron and steel goods and machinery. Agricultural products come first, forest products second, pastoral products third, and minerals and manufactures fourth. Manufactured goods form the major part of the imports. Note the cross-trade (*i.e.*, both export and import) in iron and steel goods and machinery, and also in fruits. Why ?

The chief countries with which Canada trades are the British Isles and the United States. Exports to U. S. A., 93 miliion £. ; to British Isles, 75 million £. Imports from U. S. A., £ 148 million ; from British Isles, 31 million £. This shows that Canada carries on far more trade with the United States than with the British Isles. On account of the close neighbourhood of the United States, Canada gets most of her imports from that country. This is not true of the exports, for the British Isles are in greater need of Canada's exports than the United States which produces many of Canada's products.

EXERCISES

(1) Draw a map to show the position of the Grand Bank of Newfoundland. Mark and name the Labrador current and the Gulf Stream Drift. What are the dangers to which firshermen on the Grand Bank are exposed? Give the cause of each.

(2) What difference do you find as regards the winter feeding of cattle in the eastern farms and the western ranches ? Why ?

(3) Why is the prairie region of Canada best suited for growing wheat ?

(4) Draw sketch maps to show the importance of the position of (a) Montreal and (b) Winnipeg.

(5) By what three routes can the wheat that is collected at Winnipeg be exported ?

(6) Which is the chief fruit-growing area in British Columbia? Why? How are the orchards irrigated?

(7) By which route does the tinned salmon or fruit of British Columbia reach England? Why is it taken that way?

(8) "Canadian factories are largely run by White Coal." What is 'White Coal'? Why is it largely used?

(9) Which part of Canada is without coal? Where do the people of this area get their coal from?

(10) What manufactures are carried on at (a) Toronto, (b) Quebec, and (c) Winnipeg? Give reasons for your answer.

(11) What is a winter port? Why is Halifax said to be the chief winter port of Canada?

(12) (a) Draw diagrams to represent the comparative values of the exports and imports of Canada. (b) Why does Canada carry on more trade with U. S. A. than with the British Isles? (c) Most of Canada's imports come from U. S. A., while most of her exports go to Britain. Why?

CHAPTER IX

A. Ramanathan A.L. Ramanathan

MEXICO, CENTRAL AMERICA AND WEST INDIES

A. Ramanathan

MEXICO (Fig. 44)

Mexico consists of a narrow coastal plain and a high plateau. The plateau enclosed by the eastern and western Sierra Madre is a continuation of the plateaus further north, and you have already learnt that this plateau has been built up by successive volcanic eruptions. To the

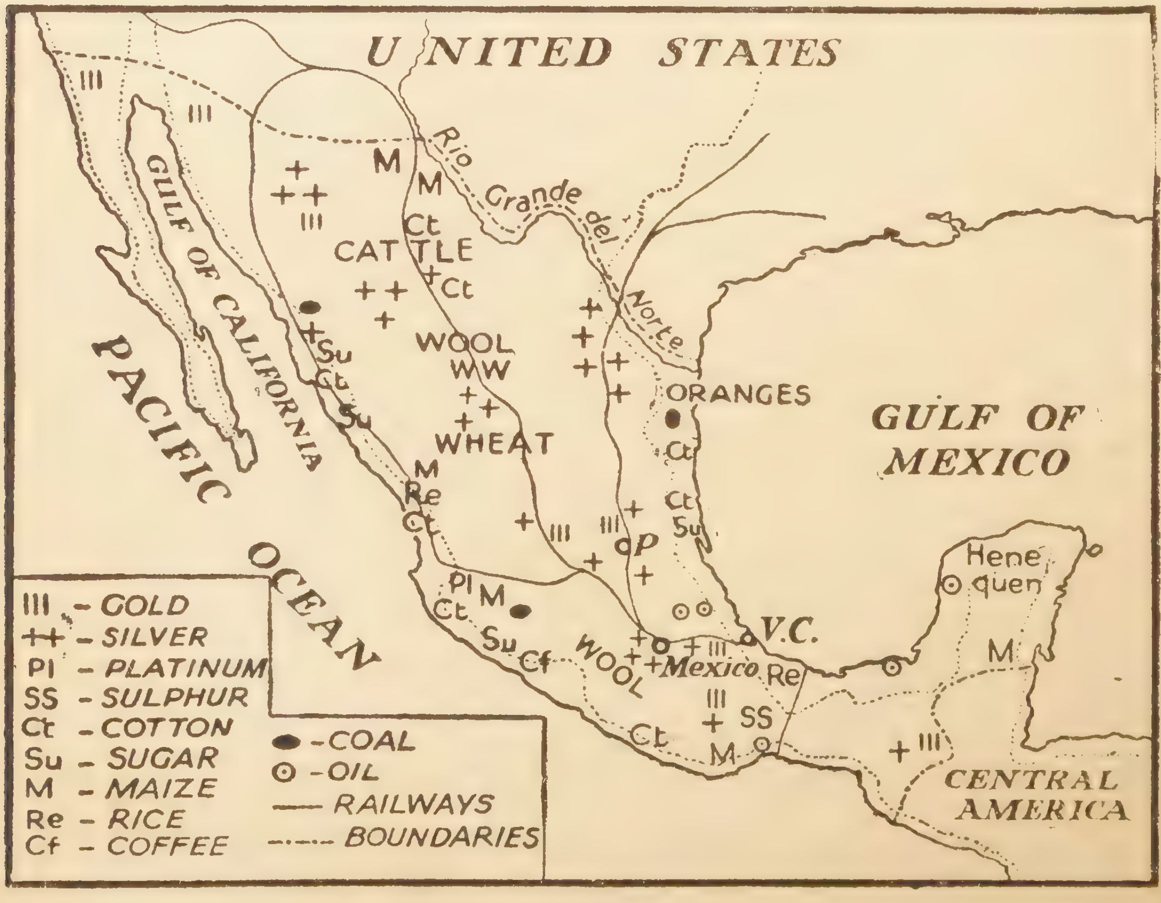


FIG. 44. Mexico Economic.

Land within the dotted line is above 600 ft., rising steeply to over 3000 ft.

south of the plateau there is a volcanic range of mountains running from west to east. This range contains such giant volcanoes as *Orizaba* (18,314 ft.) and *Popocatepetl* (17,880 ft.) Though structurally Mexico ends with the isthmus of Tehuantepec, the low lime-stone plateau of Yucatan peninsula is politically included in it. The coastal plain on the Atlantic side is broader than that on the Pacific side. There are very few good natural harbours. The rivers of Mexico descend rapidly from the plateau to the plains, and so they are useless for navigation. The plateau rivers suffer very much from want of water. Why?

Three well-marked climatic belts are found in Mexico and Central America. They are (1) the Tierra Caliente or hot belt, (2) the Tierra Templada or temperate belt, and (3) the Tierra Fria or cold belt. Compare the Andean zones (S. America). Mexico is in the track of the N. E. trade winds, and therefore its east coast has heavier rain than the west coast. Rain falls throughout the year, but seventy-five per cent of the annual rainfall occurs in summer (June to September).

The hot belt includes the coastal plains and the slopes of the mountains below 3000 ft. The wetter parts of this belt are covered with tropical forests yielding mahogany, ebony and other valuable timber. Rubber, sugar, bananas, cacao, cocoa nuts, rice and other tropical plants are cultivated.

The temperate belt is below 6,500 feet. It is a land of eternal spring and produces vine, coffee, cotton, tobacco, maize and fruits.

In the cool belt potatoes, beans, wheat and temperate fruits are grown.

Various kinds of *agave* are cultivated; from the thick leaves of *henequen* in Yucatan, a fibre-known as *sisal hemp* (used for making ropes) is obtained ; and from the milky juice of another variety, the Mexican national drink, '*pulque*' is made.

One of the most important occupations of Mexico is *mining.* The most important mineral is *silver* which is mined in nearly every state. Copper, gold, lead, iron, coal and petroleum are also obtained. The chief petroleum deposits are in the neighbourhood of Tamqico. Mexico bids fair to become one of the most important oil-fields in the world.

Stock-raising has always been an important industry in Mexico. Horses, cattle, sheep, goats and pigs are reared in large numbers. Hence woollen mills and tanneries flourish in most of the towns.

There are many cotton factories in the country, and these import cotton from Texas to supplement the home supply. *Mexico City*, the capital, is the heart of the republic, situated 7,350 ft. above sea level. It is surrounded by the best cultivated area in the country, and has linen and paper factories. It is connected by railway not only with the coastal towns but also with the United States. Its population is estimated to be about a million. *Pueblo*, south-east of Mexico City, has cotton and woollen mills run by water power, and large iron foundries make it one of the great manufacturing towns in the country. *Vera Cruz*, on the east coast, is Mexico's most important sea-gate. *Acapulco*, on the Pacific, has a harbour which is ranked next to that of Sydney.

In spite of the natural resources, Mexico is not in a very advanced state, because of its political unrest. Only 19 per cent of the population are whites, while the rest are either Indians, or of mixed origin.

CENTRAL AMERICA (Fig. 45)

You know that Central America and the West Indies are the remnants of the ancient Antillean continent where the general direction of the mountains was almost east and west. The Caribbean sea was formed by subsidence of land; and the West Indies are the tops of submerged ridges. The whole region is subject to earth-quake disturbances, *e, g.*, the recent (March 1931) disaster at *Managua* (capital of Nicaragua).

The region lies wholly within the tropics. The N. E. Trades bring very heavy rain to the east coast, while the Pacific coast has heavy summer rains from the south-west monsoon. Owing to the unhealthy climate of the lowlands on the east-coast, the uplands and the drier west coast are most densely peopled in Central America.

The French, who were the first to attempt the construction of the Panama Canal, abandoned the project owing to the ravages of malaria and yellow fever. So when the United States purchased the canal zone (5 miles on each side of the canal) from the Republic of Panama, her first task was to make the area suitable for a large number of workers to live in, *i. e.*, the work of the doctor had to precede that of the engineer.

As in Mexico, there are the three well-marked climatic belts in Central America also. In the hot belt, the chief products of the forests are rubber and timber, whilst cacao, bananas and pineapples are cultivated and exported. On the higher regions pastoral occupations are carried on, and the chief cultivated product is *coffee.* Costa Rica coffee is world-famous for quality; and coffee is the most important export of almost all the states.

From fig. 45, you will see that Central America has

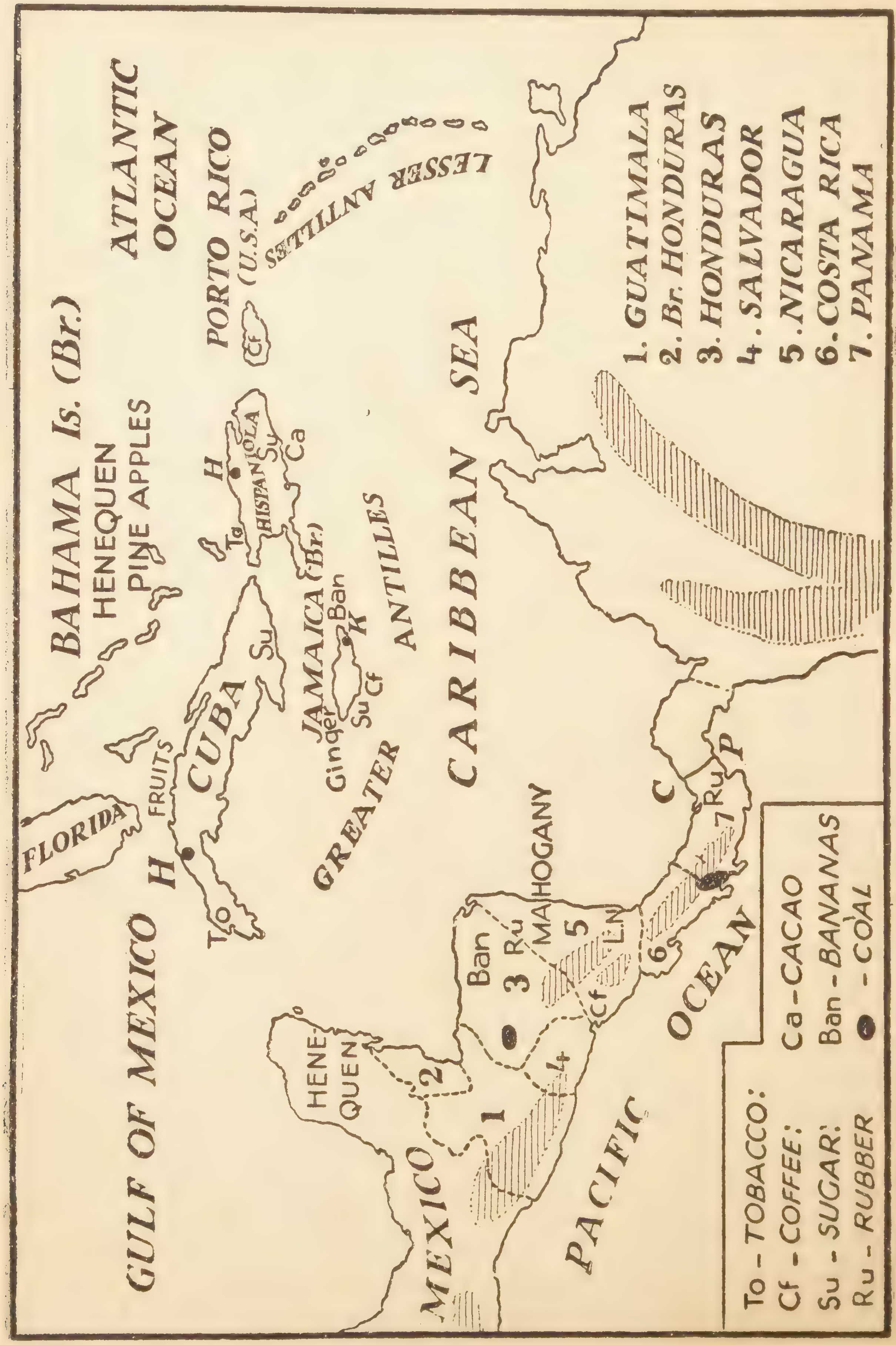


FIG. 45. Central America & West Indies: Economic. Land above 3000 ft., is shaded.

six independent republics and a British possession (Br. Honduras). The largest towns are *Gautemala* (116,000), *San Salvador* and *Managua.* Gautemala has several industries, such as cigar-making, the weaving of cotton and muslin, and the preparation of coffee for export.

Trans-isthmian railways have been constructed, one across the isthmus of Tehuantepec, another through Gautemala, a third across Costa Rica, and the fourth across the Isthmus of Panama.

THE WEST INDIES (Fig. 45)

The West Indies consist of three groups :

(1) **The Greater Antilles:** These include the large islands of Cuba, Hispaniola, Porto Rico and Jamaica.

(2) **The Lesser Antilles:** These stretch from Porto Rico to Trinidad which is a portion of South America detached from the mainland. The northern islands of this group are known as the Leeward Islands, and the southern islands as the Windward Islands. Examine your map carefully ; you will find two chains of islands. The islands of the western chain facing the Caribbean Sea are of volcanic origin, while the eastern islands are made of limestone. These islands are subject to frequent and violent earth-quake shocks, and volcanic eruptions are not uncommon ; *i. e.*, the eruption of Mont Pete in Martinique in 1902.

(3) **The Bahamas** consist of a group of about 3,000 coral islands rising from the submarine continuation of the peninsula of Florida. In the warm waters of the Gulf Stream the coral polyps live and build reefs.

The West Indies, with the exception of the northern islands of the Bahamas, lie within the Tropics. Their climate is equable, as they are islands. The prevailing winds are the N. E. Trades, and the windward slopes of all the islands receive most rain.

Cuba, the largest of the West Indies, is a republic under the protection of the United States. It supplies about one-fourth of the world's *cane-sugar*, and sends it chiefly to the United States. *Tobacco* is another important product.

Havana, the capital of the island, has huge cigar factories. Oranges, bananas and pine-apples are largely grown.

Jamaica, the largest of the British West Indies, exports bananas, oranges and other fruits, coffee, spices and tobacco. Its capital and port is *Kingston* which lies on the main route to the Panama Canal and the Far East. Besides Jamaica, the whole of the Bahamas and most of the Lesser Antilles are British.

Porto Rico, a possession of the United States, is well cultivated and densely populated. Sugar, coffee and tobacco are the chief products.

Hispaniola, consists of two independent negro republics—*Haiti* and *San Domingo.* Sugar, coffee, tobacco, cotton and cocoa are important exports ; but the island is in a backward state. The Bahamas produce pine-apples and sisal hemp. Spongefishing and salt-making are also important industries.

The Bermudas do not form part of the West Indies. They lie about 600 miles from the coast of North America, and are of coral origin like the Bahamas. They are one of the few groups of coral islands outside the tropics ; the coral formation goes on owing to the warm water carried northward by the Gulf Stream. The islands form an important British naval station. The mildness of the climate makes the islands fit for the growth of early vegetables and fruits which find a ready market at New York. The islands are becoming a health resort for Americans. *Hamilton* is the capital.

EXERCISES

(1) Compare the climate of the Atlantic coast, the plateau and the Pacific coast of Mexico.

(2) Point out the close connection between elevation, climate and vegetation in Mexico.

(3) Why is Mexico the most backward country in North America ?

(4) Make a list of the political units of Central America and find the name of the capital of each.

(5) What is 'sisal hemp'? What is its use ? Where is it largely found ?

(6) What difficulty had to be overcome before the Panama Canal could be constructed ?

(7) What are the chief products of Costa Rica, Cuba and Jamaica ?

(8) Find from your atlas the chief passages used by steamers entering the Caribbean Sea from the Atlantic.

CHAPTER X

- - - TRANSPORT - - -

WATERWAYS

The first higways were those provided by nature. The exploration and colonisation of the interior of the continents were largely directed by the rivers. The English and the Dutch settled on the tidal rivers of the Atlantic seaboard while the French settled on the wide estuary of the St. Lawrence. The English colonists crossed the Appalachian barrier through the water-gaps made by the Atlantic rivers; and when they reached the interior, they found themselves "in a maze of waterways, separated only by low divides across which canoes could easily be *portaged*." So with short portages the early trappers and traders were able to go by canoe from one stream or lake to another.

The chief waterways in the early days were the St. Lawrence, the Mississippi and the tidal rivers of the Atlantic coast. These are still of much importance, though traffic in the Mississippi has declined owing to the competition of railways.

The Hudson-Mohawk gap (Fig. 5) became an important line of communication between the New England colonies and the Ohio Basin, and between New York and the Great Lakes. Through this gap one could pass to the Mississippi basin and across is to the foot-hills of the Rockies. This Hudson-Mohawk route was followed in 1825 by the *Erie Canal* which made the trade from the lakes and the west gravitate to New York. Buffalo, the western end of the canal, become a mighty city. To day the gap is utilised by the *New York Central*. The Hudson-

Champlain-Richelieu route connects New York with Montreal.

The value of the St. Lawrence, the Mississippi and the other rivers as waterways has already been discussed in the chapter on Rivers. There is a general tendency for traffic to pass from the upper lakes *via* Buffalo and the Erie Canal to New York, rather than *via* the Welland Canal and the St. Lawrence to Montreal. The construction of the proposed *Georgian Bay Ship Canal* from Lake Huron to Ottawa may enable traffic of the upper lakes to pass direct to Montreal.

The Panama Canal (Fig. 46) which is cut through the Isthmus of Panama, is about 50 miles long, and connects *Colon* on the Atlantic side with *Panama* on the Pacific. It has been made by the United States, and it was the conquest of malaria and yellow fever that rendered its completion possible. Ships coming from the Atlantic

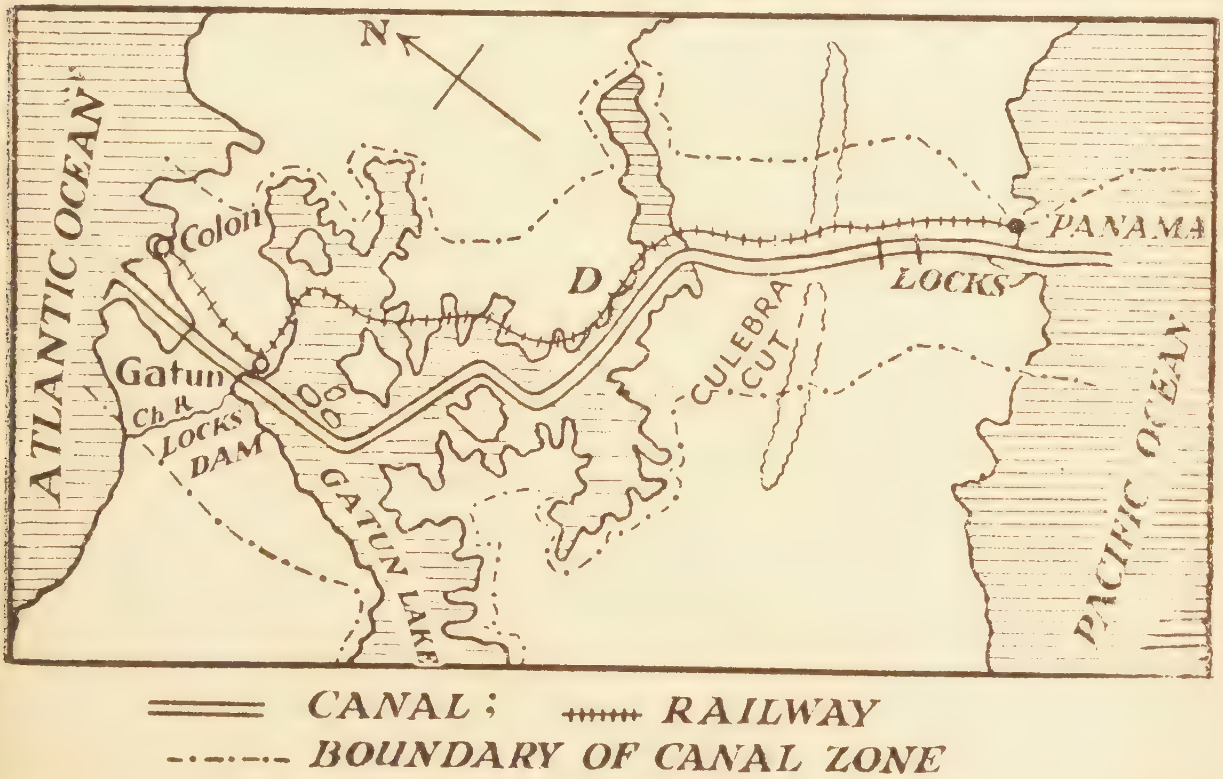


FIG. 46. The Panama Canal.

Water surface is shaded. Ch.R-R. Chagres.

enter the canal at Colon, and after travelling for five miles, are lifted 85 feet by means of a series of three locks. Then they glide quietly over the surface of a broad lake, the *Gatun Lake*, which has been formed by building a dam across the River Chagres. The overflow of the lake over the Gatun dam is used to create electricity for lighting purposes and for the supply of motive power. The navigable channel across the lake is 23 miles long. Then the ships pass through the *Culebra Cut*, a big gorge 300 ft. wide at the bottom, and about 9 miles long, and at the Pacific end, they descend by another set of three locks.

The Panama Canal is of great advantage to the United States. It shortens the distance of the sea-route from the Atlantic and Gulf ports of North America to the chief ports of western North and South America. It also reduces the distance between Britain and the Pacific ports of the two Americas and New Zealand.

From New York to	Distance saved (miles)	From Liverpool to	Distance saved (miles)
San Francisco	8071	San Francisco	5923
Valparaiso	3969	Valparaiso	1815
Wellington (N. Z.)	2713	Wellington	923
Yokohama	3768		

However, much of the trade between European ports and the Far East and Australia will continue to pass through the Suez Canal, for the Suez route is shorter.

From Liverpool to	*Via* Suez	*Via* Panama Canal
Yokohama	11,640	12,574
Shanghai	10,580	13,624
Sydney	12,234	12,553

LAND-WAYS

The first *roads* were the Indian *trails* which probably followed those originally formed by various wild animals, like the buffalo and the deer. These Indian trails were followed by the great railways. The use of the bicycle and, more recently, of the motor-car has contributed much towards the development of good roads.

At present, the railroad is the most important carrier in the internal trade of the country.

The Canadian Railways: The *Canadian Pacific Railway* is the oldest trans-continental line in Canada. It connects Halifax and St. John with Montreal, and from Montreal passes westwards through Ottawa, Sudbury and along the northern shores of the Great Lakes to Port Arthur and Winnipeg. From Winnipeg it runs westward *via* Regina, Calgary, the *Kicking Horse Pass* and the valley of the Fraser to Vancouver. A branch of the C. P. R. crosses the Rockies at the *Crow's Nest Pass* also. These lines are connected with the Canadian National Railways in the north and the U. S. A. Railways in the south. From Vancouver C. P. R. steamships carry passengers and goods to Australia, China and Japan. The distance from Halifax to Vancouver is 3655 miles, and the journey takes about 5½ days.

The National Trans-continental Line runs from Halifax, Montreal and Quebec *via* Winnipeg, Edmonton, and the *Yellowhead Pass* to Prince Rupert or Vancouver. The distance from Halifax to Prince Rupert is 3746 miles. These trans-continental railways lie at the root of all the progress and development of the farming and ranching of the Canadian interior.

The U. S. Railways: The chief trans-continental railroads are: (1) The *Northern Pacific Railroad* from

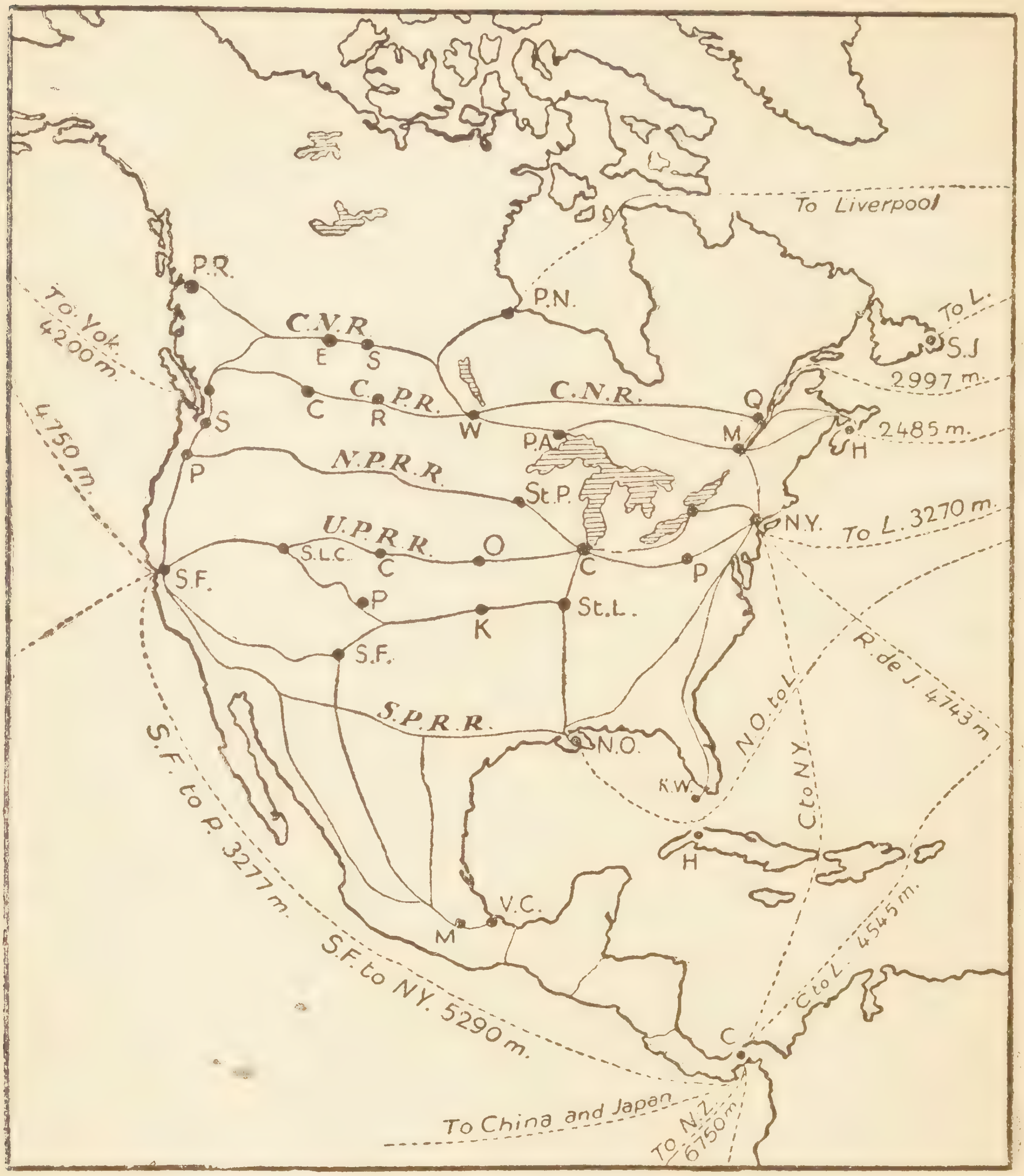


FIG. 47. N. America: Communications.
Trans-continental Railroads and ocean-routes.

New York *via* Pittsburg, Chicago, St. Paul, and the Yellowstone and Columbia valleys to Portland on the Pacific. (2) The *Central Pacific Railroad* from New York *via* Pittsburg, Chicago, Cheyenne and Ogden to San Francisco. (3) The *Southern Pacific Railroad* from New York along the Atlantic coast-plain to New Orleans, thence *via* El Paso and Los Angeles to San Francisco. The distance from New York to San Francisco, (C. P. R. route) is 3300 miles, and the journey takes about 5 days.

Electric Roads: An important feature in U. S. A. is the Light Railroad for electric cars. In and around the great towns there is a network of trolley lines. The electric trolley has developed suburban life and prevented the over-crowding of large cities. New York is provided with overhead or elevated railways.

Telegraphs and **telephones** connect all great business centres in Canada and the United States. Many submarine cables link America with Europe, Asia, Australia and New Zealand. The cables are now being supplanted by *wireless*. There is now direct wireless communication between London and New York.

Air Route: There is regular air-mail service between New York and San Francisco. The air distance between the two cities is 2665 miles, and the chief towns linked by the route are New York, Cleveland, Chicago, Omaha, Cheyenne, Salt Lake City and San Francisco. The whole route is well planned and equipped; and there are several landing places. Many great beacon lights flash their electric beams to show the pilot the way by night, for the mails should not be held up either by darkness or bad weather.

Round-the-World Routes: There are four ways out of the Atlantic basin. The two south-ward ways are (1) the Cape route, and (2) the Cape Horn route. These routes lead away from the densely peopled parts of America and Europe; and so much of their original importance has been deprived by the eastern and western routes that connect the densely peopled parts of the northern half of the world.

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The eastern route lies through the Mediterranean, the Suez Canal and the Red Sea to India and China. The western routes include (i) the sea route *via* the Panama Canal and (ii) the trans-continental railways of America. These trans-continental railways are only sections of the great round-the-world routes. Refer to any good map of the world. One can travel from Western Europe to Eastern Asia *via* the Panama Canal which is purely a sea route ; or reach the Atlantic ports of America by steamer, then cross the continent by any of the trans-continental railways to the Pacific ports, and from there reach Asia by steamer. This route is partly by sea and partly by rail.

The All-Red Routes: It will not be out of place to say something about the *All-Red Routes* here. What are they ? They are routes which pass only through British territory or "along maritime highways that can be navigated by calling at British ports only."

Starting from Liverpool on an All-Red Route round the world, a vessel can steam to Montreal in Canada, which is connected across the continent with Vancouver in British Columbia by the Canadian Pacific Railway. Or, the vessel can go to Halifax, from which place the Canadian National Railway system gives access to Vancouver and Prince Rupert on the Pacific coast. This latter railway is *All-Canadian*, which the C. P. R. is not, for it runs through the state of Maine (U.S.A.) for some distance. After leaving Halifax the Canadian National passes through Moncton (New Brunswick) to Quebec. From this city it crosses the continent to Vancouver or Prince Rupert. From here steamers may proceed across the Pacific in a south-westerly direction to the small British island of *Fanning*. From Fanning they may sail directly to the Fiji Islands, and thence the All-Red Route may proceed to Auckland, in New Zealand or Sydney in Australia. From Sydney vessels may proceed round the coast of Australia to Perth before entering the Indian Ocean.

From Australia and New Zealand two All-Red Routes are available; one calling at the Indian ports and passing through the Suez Canal, and the other by the Cape of Good Hope. Vessels passing through the Suez Canal call at Malta and Gibralter before reaching England; those going by the Cape route may call at Mauritius before reaching Cape Town, and on leaving Cape Town, they may call at St. Helena, Ascension, and Freetown (capital of Sierra Leone on the coast of West Africa), and then proceed straight to England.

EXERCISES

(1) Why was the Erie Canal constructed from Lake Erie and not from Lake Ontario?

(2) "When the Georgian Bay Ship Canal is an accomplished fact, Montreal will compete with Buffalo." For what articles? Why?

(3) Describe how a steamer gets through a lock. Draw diagrams to illustrate your answer.

(4) To which countries is the Panama Canal of very great importance?

(5) "The Panama Canal is not likely to affect the importance of the Suez Canal." Why not?

(6) Draw a sketch map of the C. P. R. On it mark the products of the various regions traversed by the route.

(7) Explain: "The trans-continental railways of America are connecting links in the round-the-world routes."

(8) In what respect does the Cape-to-Cairo railway differ from the trans-continental lines of America?

(9) What is the special importance of electric railways in America?

(10) What is an All-Red route? Trace its course round the world.

EURASIA & INDIA

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PART I

EURASIA

EURASIA

CHAPTER I

POSITION, SIZE, SEAS, COAST AND RELIEF

You know that there are four continents in the Old World, and you have already studied two of these, *viz.*, Africa and Australia. The remaining two continents of Europe and Asia form one great land mass which is often spoken of as *Eurasia*, Europe being only a peninsula attached to the great continent of Asia. The Urals in the east of Europe are not a true boundary between Asia and Europe, because the physical features, the climatic conditions and the character of vegetable and animal life on both the sides of the mountains are more or less similar. Again, the mountains have never been a barrier between the inhabitants on both sides.

But Europe is regarded as a separate continent, because of its commercial importance and the political power of its peoples. Though Europe is geographically a dependency of Asia, Asia is politically a dependency of Europe. Moreover, the peoples of Europe differ vastly in physical characteristics, civilisation and religion from those of Asia.

POSITION

Eurasia extends from the equator to about 77° N. Lat., and from 10° W. Long., eastwards to the 180° meridian, so that it covers nearly the northern half of the Eastern

Hemisphere. Asia lies in all the three zones, while Europe lies mostly in the North Temperate zone, for it extends from 35° N. Lat. to 71° N. Lat. What is the longitudinal extent of Europe ? Can you say that Europe is twice as long as it is broad ? Note that the southern limit of Europe is almost the northern limit of India.

In the east, Eurasia is separated from North America by the Bering Strait and the Pacific Ocean. In the south-east lies Australia with which it had once land connection. In the south-west lies Africa which was connected with it by the Isthmus of Suez but is now separated by the Suez Canal.

SHAPE AND SIZE

Asia is roughly rectangular in shape, while Europe is triangular. Out of a total land surface of 36 million square miles in the Old World, Eurasia occupies nearly 21 millions. With the exception of Australia, Europe is the smallest continent, its area being a little less than 4 million square miles. How many times the size of Europe is that of Asia ?

SEAS AND COAST

To the north of Eurasia lies the cold Arctic Ocean which is frozen for the major part of the year ; to the east lies the broad Pacific ; to the west lies the highly commercial Atlantic Ocean ; and to the south lie the Indian Ocean and the Mediterranean Sea. The seas to the east of Asia are land-locked as they are hemmed in by island-festoons. Of these, the *China Sea* in the south is very important as it lies in the midst of the most productive regions of Asia.

The Red Sea, 1,200 miles long and 250 miles broad, occupies, as you know, a portion of the bed of the great Rift Valley. Its importance as a highway of commerce has increased after the opening of the Suez Canal.

The Mediterranean Sea is the largest sheet of inland water in the world, connected with the Atlantic Ocean by the Strait of Gibralter. It can be divided into two basins the western and the eastern; and it should be noted that at one time the great sea was not a continuous sheet of water; for you have already studied in connection with Africa that the Apennines of Italy were once continued through Sicily to the Atlas mountains of North Africa. Find from your atlas some of the arms of the Mediterranean.

The Black Sea is an inner chamber of the Mediterranean connected to it by the Strait of Bosporus, the Sea of Mannora and the Strait of Dardanelles.

The Mediterranean Sea is almost land-locked, and so it is *tideless*. It is a great highway of commerce, and the island of Malta, south of Sicily, is the half-way house.

The Bay of Biscay, the English Channel, the North Sea, and the Baltic Sea in the west, and the White Sea in the north have all been formed by the subsidence of the western margin of the great Eurasian plain. The *Baltic Sea* is almost land-locked like the Mediterranean, but it is only 216 feet deep, and is easily frozen in winter.

The Continental Shelf (Figs. 1 and 2) of Eurasia is broadest in the north-west as well as in the south-east. The British Isles rise from the continental shelf of Europe as the Malay Islands do from the continental shelf of Asia. As in the case of the continental shelf of Newfoundland, the shallowness of the North Sea encourages great fisheries. The *Dogger Bank*, the shallowest part of the North Sea, is the chief fishing ground. Why?

Look carefully at the map of Europe, and notice how long arms of the sea penetrate far into the land causing large peninsulas. Hence, in comparison with its size, Europe has the longest coast-line, and no part of Western Europe is more than 400 miles from the sea. But Asia is a huge, compact mass with no large arms of the sea penetrating far into the interior of the land; so its coast-line is relatively short, compared with its great size, and some parts of Central Asia are more than 1,500 miles from the sea. Europe has one mile of coast-line for every 192 square miles of area, while Asia has one mile of coast-line for every 491 square miles of area.

Note that the west coast of Norway is cut into by deep fiords as the coast of British Columbia and South Chile.

Effects of the long coast-line of Europe: (1) The influence of the sea is felt far inland so that the climate of Western Europe is equable. (2) No place is far from the sea for purposes of trade. (3) The people of Western Europe have become sailors and traders in all parts of the world. (4) They have also become explorers and colonists.

RELIEF OF EURASIA

Look carefully at the physical map of Eurasia. You will find four main features. (1) In the north-west of Europe and in the north-east of Asia lie plateaus of ancient rocks which include the worn-down mountains of Scandinavia and the Yablonoi and Stanovoi Ranges. (2) The Great Northern Lowlands extend from the Bay of Biscay in the west to the mouth of Lena in the east. These plains have been rightly compared to an eagle with its wings outstretched, the Urals being its back-bone and Novaya Zemlya, its beak. (3) The central mountain system girding the whole of the continent from the Pyrenees to Eastern China. (4) The peninsulas jutting southwards into the Mediterranean Sea and the Indian Ocean—the Iberian, Italian and Balkan peninsulas of Europe and the Arabian, Indian and Malayan peninsulas of Asia. Let us now study the relief of Europe and Asia as separate continents.

THE RELIEF OF EUROPE (Fig. 1)

According to structure, Europe falls into four divisions: (1) *The North-western Highlands*, (2) *The Central Lowlands*, (3) *The Highlands of Central Europe*, (4) *The Folded Mountains of Southern Europe.*

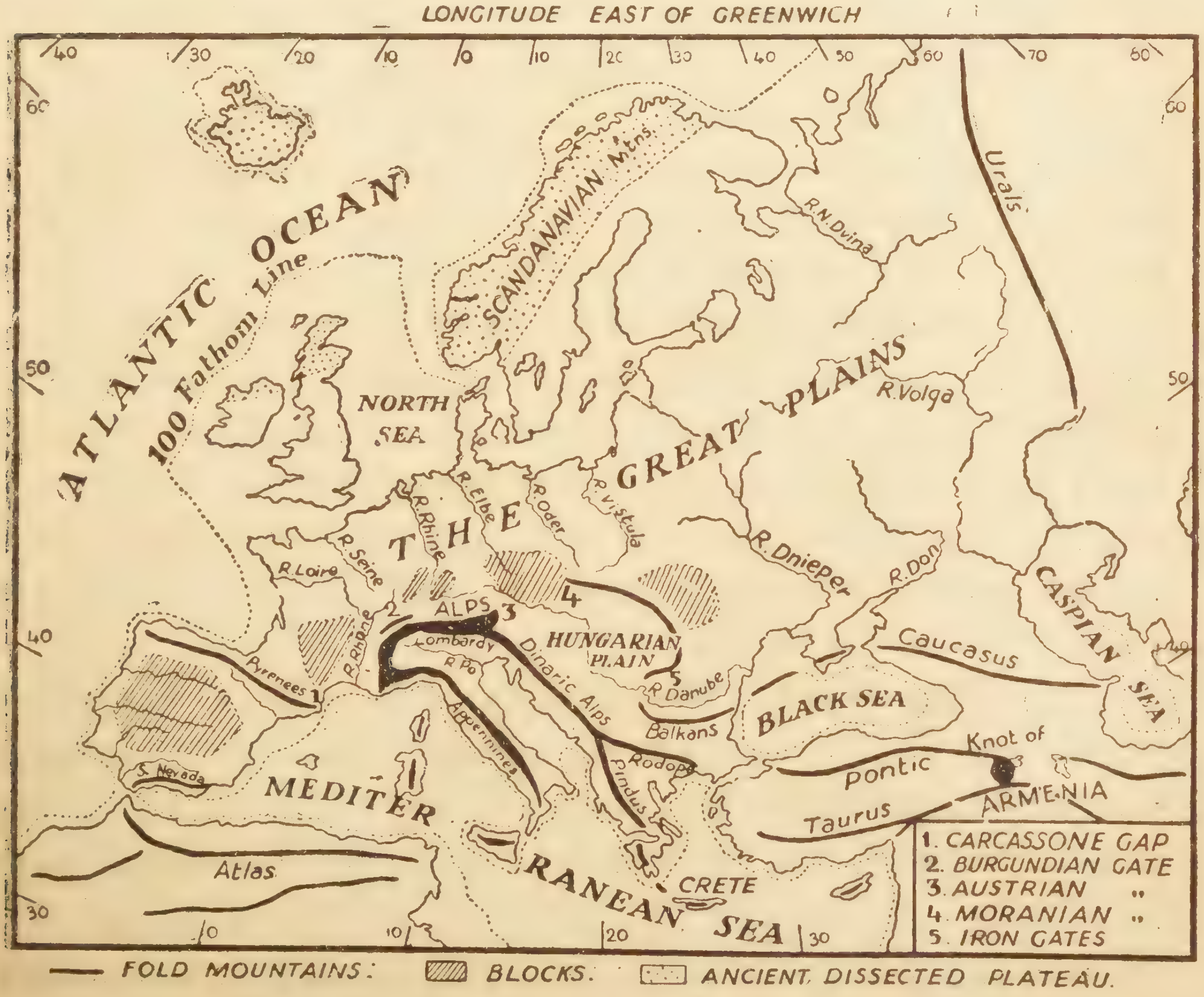

FIG. 1. EUROPE: Relief and Rivers.

(1) **The North-Western Highlands** include the Scandinavian Highlands, and the Highlands of Northern Scotland and Ireland. This *dissected* (cut up by river and rain) plateau is the worn-down remnant of an ancient continent (*Arctis*). The present mountains are mere stumps of what they once must have been. Such mountains are known as *residual* mountains.* Finland is part of this region, but its surface has been reduced to a peneplain, largely by glacial action. Compare the Canadian Shield with its numerous lakes. The lakes of Sweden and Finland occupy hollows scooped out by the ice-sheet which once covered Northern Europe.

(2) **The Central Lowlands** extend from the Atlantic to the Urals and include south-eastern England. The North and Baltic Seas are portions of the great plain covered by shallow waters. These plains are not absolutely flat, but are broken up by small hills. Much of the plains is less than 500 feet above sea-level, and the greatest height is attained in *Valdai Hills* (1,100 ft.) in Russia.

(3) **The Highlands of Central Europe:** South of the great plain stretches a series of block mountains which include the Spanish Meseta, the Central Plateau of France, the Vosges Mountains, the Black Forest and the Bohemian Plateau. These highlands are rich in minerals. The islands of Corsica and Sardinia are also remnants of a plateau of ancient rocks.

(4) **The Folded Mountains of Southern Europe:** These are much younger than the Central or the North-western Highlands. The main fold runs through the Alps, the Carpathians, the Tran-Sylvanian Alps, the Balkans and

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* Residual—that have been 'left' standing when the surrounding land has been worn away.

the Caucasus. From this main line run secondary lines. To the south-east of the Alps run the Apennines which are continued through Sicily to the Atlas Mountains of Africa (See Fig. 1, AFRICA). A branch from here curves northward and runs eastward in Spain as the Sierra Nevada. This can be traced to the Balearic Isles. From the western end of the Alps another branch runs south-westwards, but it is cut off by the sea, and reappears as the Pyrenees and the Cantabrians. From the eastern end of the Alps run the Dinaric Alps along the eastern shores of the Adriatic sea, and these are continued through Greece, Crete and Cyprus to the Taurus mountains of Asia Minor. Close to the Alps on the north-west lies a small range, the Jura.

The two most important plains enclosed by the fold mountains are the valley of the *Po* (Italy) and the *Hungarian* (or mid-Danubian) *Plain*.

The direction of the mountain folds is determined by the position of the separate blocks of the Central Highlands which acted as buttresses against which the folds were pressed. Between the Central Highlands and the Fold Mountains convenient lowland passages occur. These are generally known as '*gates*' (Fig. 1), and it is through these 'gates' that the chief railways of Europe run. The *Gate of Carcassone* lies between the Pyrenees and the Central Plateau of France; the *Burgundian Gate* between the Jura and the Vosges, *the Austrian Gate* between the Eastern Alps and the Bohemian Plateau; the *Moravian Gate* between the Bohemian Plateau and the Carpathians; and the *Iron Gates* between the Tran-Sylvanian Alps and the Balkans. Study the map carefully and try to remember the names of the mountains and blocks.

The mountains and plains of Europe are a continuation of those of Asia.

RELIEF OF ASIA (Fig. 2)

According to relief and structure Asia falls into five divisions : (1) *The North-eastern Highlands,* (2) *The Great Northern Lowland,* (3) *The Central Mass of Mountains and Plateaus,* (4) *The Southern Plateaus,* and (5) *The Isolated River Valleys.*

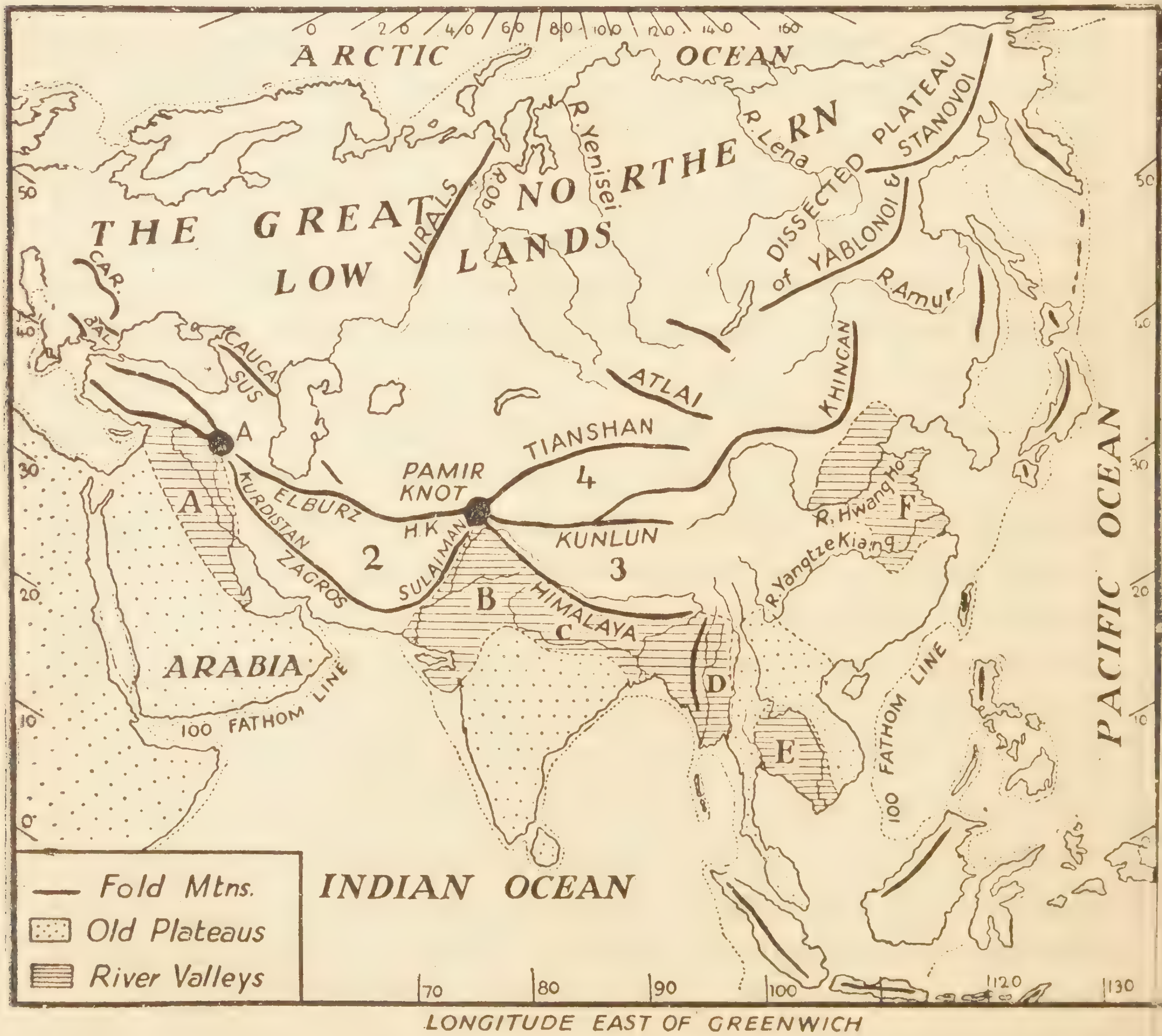


FIG. 2. ASIA : Relief and Rivers.

(1) **The North-Eastern Highlands** are, like the North-Western Highlands of Europe, very old, much worn down mountains. These stretch from the Amur

River to the Bering Strait. The Yablonoi and the Stanovoi are *residual* mountains. This region is also the remnant of an ancient continent (*Angaraland*).

(2) **The Northern Lowland** extends from the Caspian Sea north-eastwards to the Arctic Ocean. This is broad in the west and narrow in the east. The plain is drained by three mighty rivers into the Arctic. Name the rivers. In the south-west of this plain lies the Aralo-Caspian Basin, the largest inland drainage area in the world.

(3) **The Central Mountain System** is the greatest mountain mass in the world ; and the European mountains cannot be compared either in height or extent with the Asiatic mountains. Mt. Everest the highest peak of the Himalayas is nearly twice as high as Mt. Blanc, the highest peak of the Alps. The Asiatic section of the great mid-old-world fold system consists of two main chains which run west to east, diverging and enclosing plateaus and converging (in two places) to form mountain knots. The Pontic and Taurus Ranges enclose the plateau of Asia Minor and meet together at the *mountain knot of Armenia.* To the east of this knot the ranges diverge and enclose the plateau of Iran. The northern chain includes the Elburz Range and the Hindu Kush, and the southern chain includes the Kurdistan and Zagros, and the Kirthar and Sulimani Ranges. These converge to form the big *knot of the Pamirs.* Again they diverge and enclose the Tibetan Plateau (the highest plateau in the world), the northern range being the Kuenlun and the southern the Himalayas. The northern line continues north-eastwards as far as the Khingan mountains which form the eastern boundary of the Mongolian table-land. The southern line bends sharply south, and continues across Burma southwards through the Andamans and Nicobars to Sumatra and Java.

North of the main folds there is a third chain which is not continuous. This chain includes the Caucasus in the west and the Tian-shan in the east. Between this northern chain and the central chain lies a number of depressions (not plateaus)—the Black Sea, the southern part of the Caspian sea and the Tarim Basin. East of the Tian-shan lies the Altai. Between the Altai and the Tian-shan is the *Zungarian Gate* a natural route from the Siberian plain to the Mongolian plateau. The Tarim Basin is a low plateau and consists of highland, lowland, desert and marsh. The southern part of the basin excepting the river valleys forms the *Taklamakan Desert.* Many cities, once flourishing and well-populated, lie buried under the sand.

(4) **The Plateaus of the South** include Arabia, the Deccan and Indo-China. These are plateaus of old hard rocks, and are supposed to be remnants of an ancient southern continent (*Gondwanaland*).

(5) **The Isolated River Valleys:** These are fertile lowlands separated from one another by mountains or plateaus. Find their position on the map (Fig. 2): (1) *the Tigris and Euphrates Basin* or the plain of Mesopotamia (=between two rivers) or Iraq; (2) *the basins of the Indus and the Ganges,* forming the plain of Hindustan; (3) *the Irrawaddy Basin;* (4) *the Mekong Basin;* and (5) *the Lower Yangtse and Huang-Ho Basin.*

To these five regions we may add another—*the island "festoons"* along the east coast of Asia south of the Peninsula of Kamchatka. This peninsula is continued southwards through the Kurile, Japanese, Lu-chu, and Philippine Islands. The whole region possesses many volcanoes and is subject to earthquake shocks. Fig. 3 shows that the *Volcanic Belt* extends all round the margins of the Pacific Ocean. Between the island chain and the

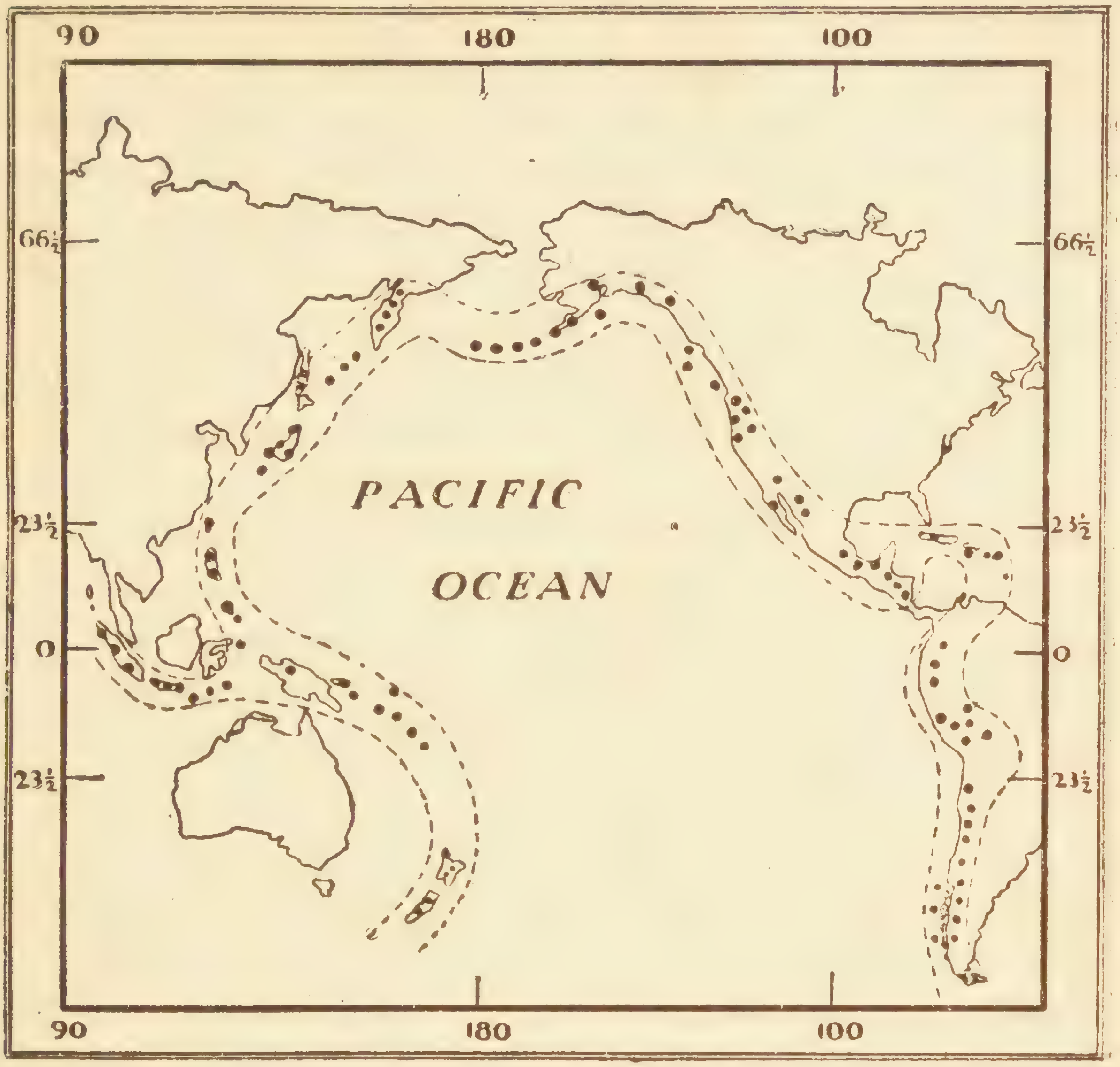


FIG. 3. The "Fiery Ring."

Volcanoes borderidg the Pacific Ocean.

(The chief volcanoes are marked by dots.)

mainland are the seas of Okotsk, Japan, Yellow, East and South China. The basins which they occupy have been made by the subsidence of blocks of earth's crust. The island festoons mark the true eastern limits of Asia.

Look closely at the physical maps of Europe and Asia. You will be able to find some rather striking points of comparison. The British and Japanese Islands may be looked upon as parallels. Scandinavia corresponds with

Kamchatka, and Denmark with Corea. The three southern peninsulas of Europe are paralleled by the three southern peninsulas of Asia—Iberia by Arabia, Italy by India, and the Balkan peninsula by Indo-China. Note that Sicily at the toe of Italy is like Ceylon at the tip of India and the islands of the Ægian Sea correspond with the East Indies. The Alps north of Italy can be compared with the Himalayas north of India ; but the former is not such a formidable barrier to communication as the latter.

RIVERS OF EUROPE

Most of the rivers of Europe rise on the northern slopes of the mountain axis, and flow generally in a north-westerly course, thus reaching either the Atlantic Ocean directly or the seas connected with it. Almost all the Atlantic rivers have estuaries while those of the Mediterranean have deltas at their mouths, *e. g.*, the *Rhone*, the *Po*. This is due to the fact that the Mediterranean sea is tideless. The chief rivers flowing into the Atlantic are the *Loire* and the *Seine* in France, the *Rhine*, the *Elbe* and the *Oder* in Germany and the *Vistula* in Poland. Most of the rivers of western Europe are well suited for navigation, for they have slow and steady courses, and are subject neither to extreme floods nor droughts. Moreover their value has been enhanced by artificial deepening, and by their inter-connection by canals. River valleys form natural routes which can be easily followed by roads and railways, *e.g.*, the Rhine, Rhone and Danube valleys. Routes across the Alps have been possible on account of the transverse and longitudinal river valleys. For example, the Adige on the southern slope of the Alps is only separated from the Inn, a tributary of the *Danube*, by the low Brenner Pass. Roads and railways follow these valleys. Find out other examples by referring to the map showing routes across the Alps (Fig. 31).

The Rhine (810 miles) is, on the whole, the most important river in Europe. It rises on the northern slopes of the St. Gothard mountains and flows northward into Lake Constance. From this lake it flows westward as far as Basle, forming the boundary between Germany and Switzerland. At Basle, the river turns north, and flows through the *rift valley* between the Vosges and the Black Forest, forming the boundary between France and Germany. At Mayence the river is diverted to the west for 20 miles and at Bingen it turns north. Here it is hemmed in by rocky hills with very little room for road or railway. After passing through Germany for a long distance, the river turns westward and flows through Holland. Here the low banks of the river are protected by embankments. The Rhine is an important waterway for the following reasons: (1) Its channel is deep and open, and many river harbours have been constructed. (2) Its valley is rich in mineral and vegetable productions. (3) It flows through the most populous part of Europe. (4) It empties itself into one of the most frequented seas. (5) Its mouth is opposite the important commercial country of Great Britain. (6) It is connected by canals with the other river systems—the Rhone, the Seine and the Danube.

The Danube (1,700 miles), nearly as long as the Indus, is also an important river, since it defines a great route from Central Europe to the east. It flows through South Germany, Austria, Hungary, Yugo-Slavia, and Rumania and thus forms an international waterway. It is the chief outlet for the produces of Austria and Hungary. The valley of the Danube was the highway by which the crusaders went eastward to the Holy Land, and along which came invaders from Asia. The cataract at the Iron Gates has been avoided by a navigable canal (2,700 yards long) cut out of solid rock. The river enters the Black Sea by a swampy delta which is frozen in winter for about 40 days.

The Rhone in France receives its chief tributary, the *Saone* at Lyons. The Rhone—Saone valley forms the chief route for roads and railways from the Mediterranean to Central Europe. A canal cut through the Burgundian Gate (between the Vosges and the Juras) connects the Rhine and the Rhone, and thus makes a waterway between the Mediterranean and the North sea.

The longest river in Europe is the *Volga* (2,200 miles); but it is not commercially important, because (1) it is frozen for three months in a year, (2) its lower course lies through poor country, (3) its delta is choked with mud, and (4) it flows into the Caspian Sea, an inland lake. But all the Russian rivers are slow-flowing and, therefore, navigable when they are not frozen.

RIVERS OF ASIA

These are not long in proportion to the size of the continent, for the mountains lie in the centre and the rivers flow in all directions. Contrast these with the rivers of the Americas where the mountain axis lies on one side and the rivers can flow the whole breadth of the continents.

The Arctic Rivers: The *Ob* (2,800 miles), the *Yenisei* (3,200 miles) and *the Lena* (2,800 miles) are the chief rivers, flowing northward from the Central Highlands to the Arctic Ocean. The three rivers with their tributaries cover the whole of Siberia with a network of waterways affording altogether some 30,000 miles of navigable water. But they are frozen for the major part of the year, and flow into a frozen ocean; hence there is little traffic carried on by them. As the ice in their upper courses melts before that in their lower courses, floods are caused and wide areas are converted into swamps. The tributaries of the rivers flow east and west, approaching one another with short portages. So there is an almost uninterrupted highway from west to east for about 6,000 miles. Hence it has been possible for the Russians to extend their empire eastwards into Siberia.

The Pacific Rivers are *the Amur, the Hwang-Ho the Yangtse-si-kiang, the Mekong* and *the Menam.*

The Amur (2,700 miles) is, like the Arctic rivers, frozen for nearly six months in the year, and therefore is not of much commercial importance.

The Hwang-Ho or Yellow River (2,500 miles) is so called because its whole basin is occupied by the yellow *loess.* (See Fig. 39). Its lower course is noted for its extraordinary shiftings which are unparallelled for their vast extent and destructive character. The vast quantity of silt brought by the river makes it difficult to control the river and to preserve the level of its bed. During the disastrous flood of 1852, the river broke through its left bank and completely changed its course. Before that year it entered the Yellow Sea, now it enters the Gulf of Pe-Chili. Recently in 1928, the river broke its banks near its mouth, and 80 villages were flooded, and 20,000 inhabitants were left homeless. Hence the river is not of great value as a highway; and it is rightly called " China's sorrow."

The Yangtse (3400 miles) is the largest river of Asia and the main *artery* of China. It rises like its sister stream in the Plateau of Tibet, runs at first south-eastwards, and then turns abruptly northwards and then eastwards. Two of its right-hand tributaries flow through large lakes before entering the main stream. These lakes receive the overflow of the main river during floods, and prevent wide-spread ruin which is so common in the Hwang-Ho valley. In the lower course, the river bed is 10 ft. above the surrounding country, so that gigantic embankments have been built to retain the stream. Compare the Lower Mississippi. At its mouth, the river is 60 miles wide and 300 ft. deep, and tides penetrate 200 miles up the estuary. The river is navigable for ocean-going steamers as far as Hankow, and for smaller vessels as far as Ichang where gorges and rapids begin. Beyond the gorges is the Red Basin of Seehwan named from its red soil. (See Fig. 39)

The Indian Ocean Rivers: *The Euphrates* and *the Tigris* uniting to from *the Shat-el-Arab*, *the Indus*, *the Ganges*, *the Brahmaputra* and *the Irrawaddi*, are the chief rivers. The soil brought down by these rivers has built up fertile alluvial plains and deltas. All these are useful for irrigation and some of them are also useful for navigation.

The Shat-el-Arab is navigable for large vessels, while the Euphrates is navigable for 1,000 miles for small vessels and the Tigris as far as Bagdad. You will learn more about the other rivers when you study India.

Rivers of Inland Drainage are those flowing into inland seas and lakes and those which disappear after a shorter or longer course. The most important rivers of this class are: (1) *the Volga* and *the Ural* which flow into the Caspian; (2) *the Syr* and *Amu* which flow into the Sea of Aral; (3) *the Tarim* which disappears in the Lob Nor; (4) the *Ili* flowing into Lake Balkash; (5) the *Jordan* flowing into the Dead sea (1,300 ft. below sea-level). The Syr, the Amu and the Tarim are useful chiefly for irrigation. Many of the rivers of Arabia and the Central Plateaus are mere *wadis*, *i.e.*, channels that are full of water only for a short period of the year.

EXERCISES

(1) Why should Europe be taken along with Asia to form one continent? Why is it generally treated as a separate continent?

(2) Find the greatest length and breadth of Eurasia in miles.

(3) Is it correct to say that the length of Europe is twice its breadth?

(4) Compare the size of Eurasia with that of each of the southern continents.

(5) In what respects does the Mediterranean Sea differ from the Baltic?

(6) State the importance of the continental shelf in the north-west of Europe.

(7) Mention the chief effects of the long coast-line of Europe.

(8) Explain: "dissected plateau"; "residual mountain."

(9) What are "Gates"? How are they important? Illustrate your answer.

(10) Draw a diagrammatic section across Asia (South to North) and name the various features.

(11) Identify the plateaus and plains numbered in the physical map of Asia.

(12) Why are the rivers of Europe well suited for navigation?

(13) Why is the Rhine the most important waterway in Europe?

(14) Explain: "The Danube is an international waterway."

(15) How have the Siberian rivers helped Russian expansion eastward?

(16) Point out the defects of (a) the Arctic Rivers, (b) the Volga, and (c) the Hwang-Ho.

CHAPTER II

CLIMATE

TEMPERATURE

Winter Temperature: Look at Fig. 4 showing January isotherms. As the great land mass of Asia extends over a wide range of latitude, *i. e.,* from 0° to 77° N., the effect of latitude on temperature is well marked: near the equator the temperature is 80° F., while in the north-east of Siberia it is −50° F. This low temperature is due to the following causes: (1) The land is much cooler in winter than the sea. (2) Northern Asia is cut off from the warm influences of the southern oceans by the Central Mountains and Plateaus. (3) It is far away from the influence of the Atlantic Ocean. (4) The sun being overhead at the Tropic of Capricorn, the duration of daylight is very short. Western Europe is peninsular and so the warm influence of the sea is felt in the interior. This warm influence is due to the prevailing westerlies and it is maintained by the warm *Gulf Stream Drift* that washes the western shores of Europe as far north as 70° N. Latitude. Hence in Europe the temperature decreases from west to east, while in Asia it decreases generally from south to north. The general trend of the isotherms of Europe in January is north to south, while in Asia it is from west to east. As the ocean is the chief influencing factor of the January temperature of Europe, the January isotherms are called *sea-lines.*

The "*cold pole*" (the coldest part) of the world lies round *Verkhoyansk* where a temperature of −92° F. has been recorded. Find out from your atlas what countries

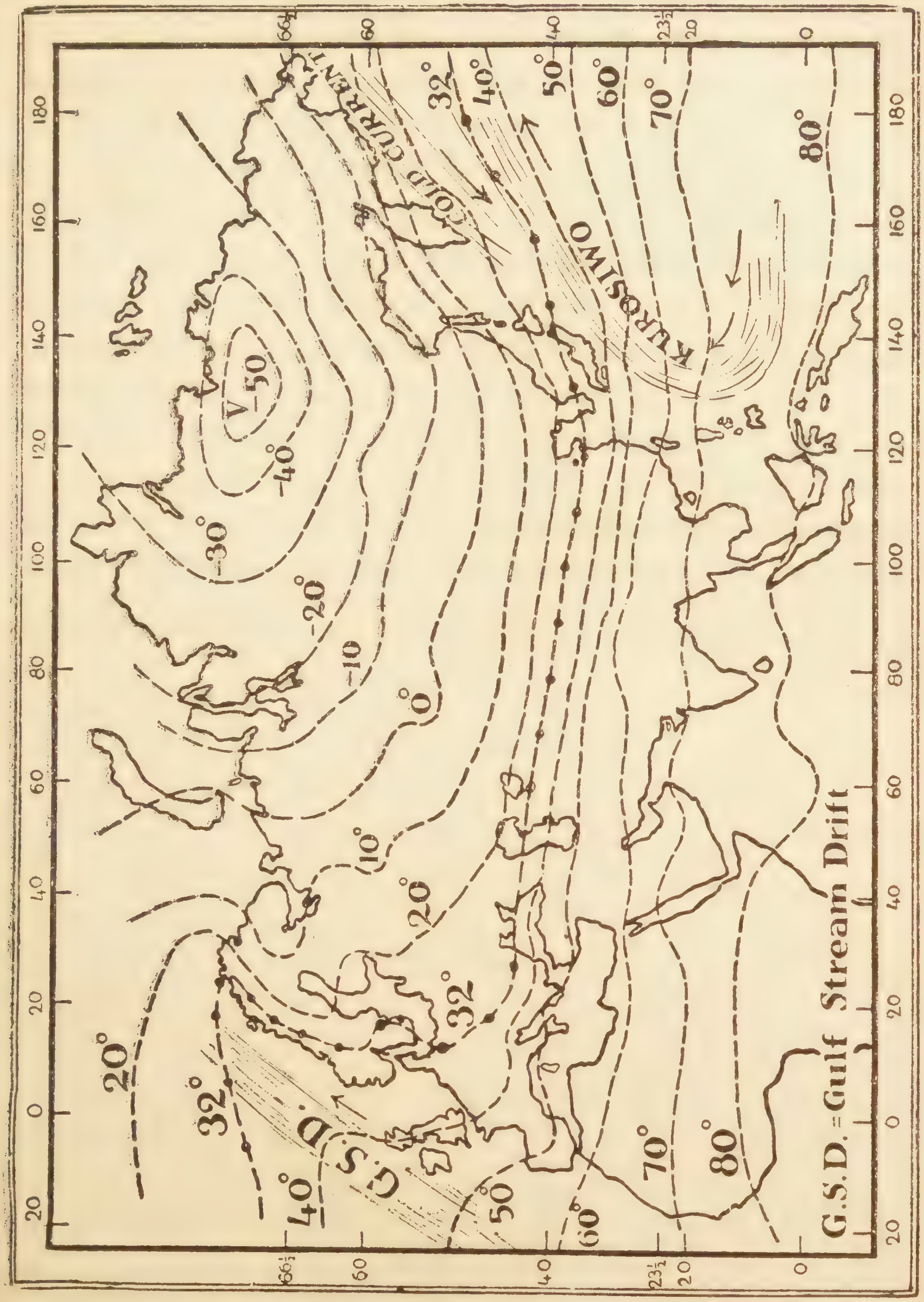


FIG. 4. EURASIA: January Isotherms.
Note that the temperature (°F) decreases from west to east in Northern Eurasia.
V-Verkhoyansk-Cold Pole; i.e., the coldest spot in the world.
Name the parts of Eurasia which will be covered with snow.

of Eurasia have a temperature less than 32° F. Note how the isotherms bend northwards when they reach the Pacific Ocean. This is because the temperature of air over the sea is warmer than that over the land. This warmth of the air over the sea is also due to the warm *Kuro Siwo Current* which flows northwards along the eastern coast of Japan. The north-east coast of Siberia is washed by a cold current coming from the Bering Strait. Hence the temperature is less than in the corresponding latitudes in North-West Europe. *Cf.* Bergen (Norway), Jan.: 34° F., July: 58°F.; Okhotsk (Siberia), Jan.: 10°F.; July: 55° F.

Summer Temperature: Look at Fig. 5 showing July isotherms. Even in Europe the isotherms are more

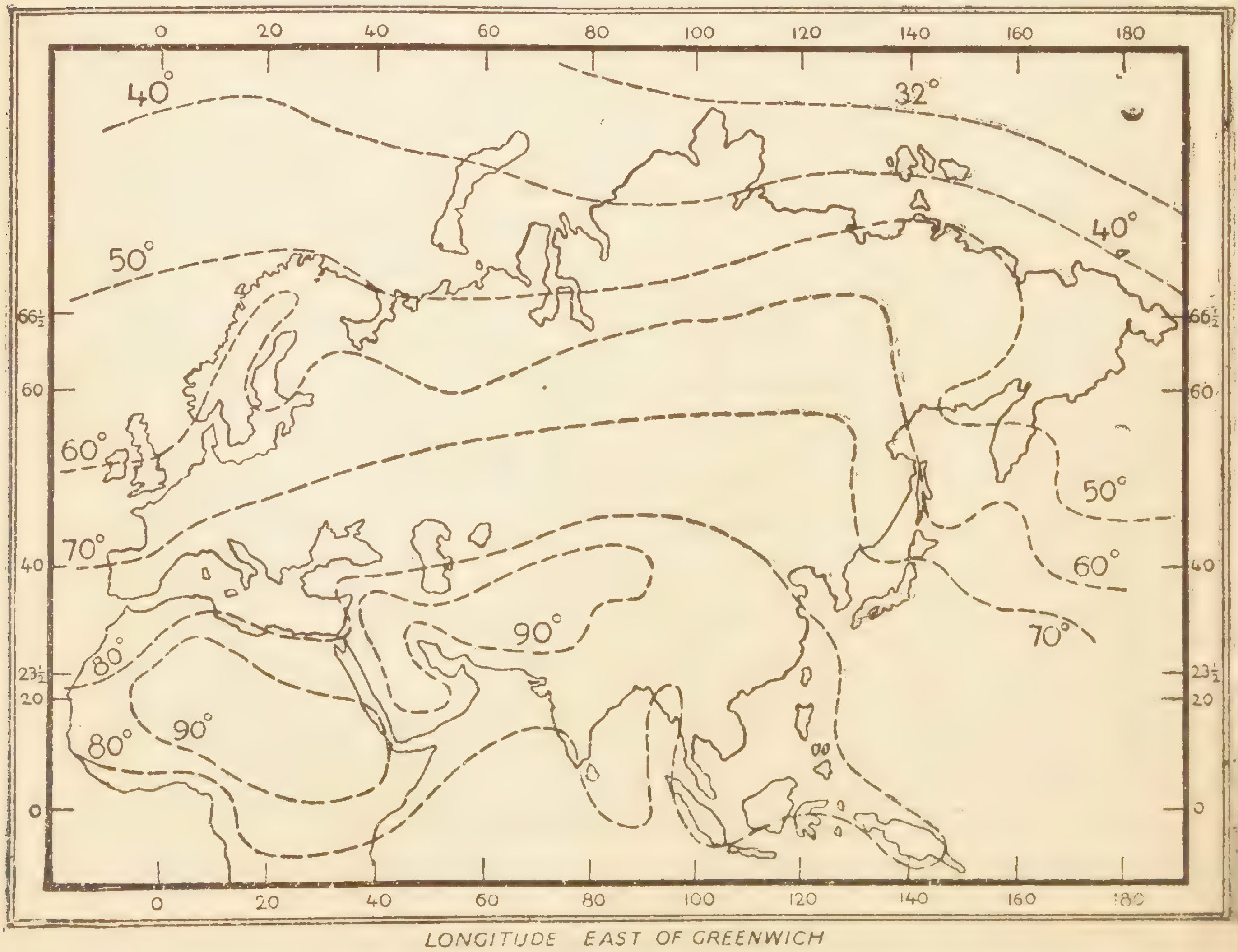


FIG. 5. EURASIA: July Isotherms.

or less parallel to lines of latitude as the sun is now the dominant influencing factor; so the July isotherms of Europe can be called *sun-lines.*

The sun is overhead in June and July near the Tropic of Cancer. Hence the region of greatest heat (over 90° F.) lies over Arabia, Iran Plateau and the Indus Basin. This area of greatest heat is continued westwards over the Sahara. In fact the great heat of this area is also due to its nearness to the land mass of Africa which cuts off oceanic influence. Again as the land is warmer than the ocean, the isotherms bend northwards in the interior of the continent. Note the remarkable northward extension of the 70° F. isotherm over mid-Asia. No part of the continent is below 32° F.

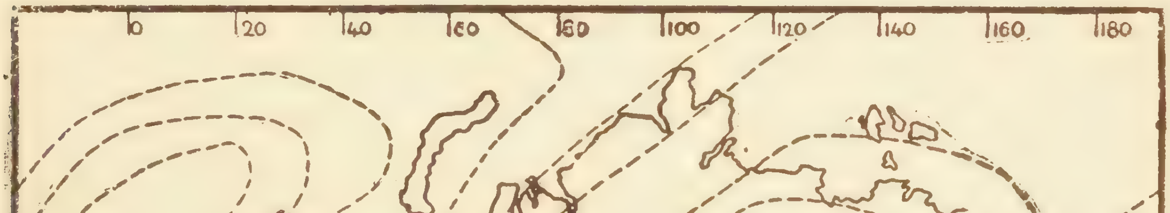


FIG. 6. EURASIA: Annual Range of Temperature.

Note that in Europe the range increases from west to east, and in Asia it increases from south to north.

The Mean Annual Range of Temperature :—Study Fig. 6. You have already learnt that the range of temperature is small near the ocean and it is usually high in the interior of a continent. Where the range is small there the climate is *equable* ; where it is great it is *extreme*. Note that near the west coast of Europe the range is 20° F. while it increases eastwards towards the interior till it reaches 120° F. in North-east Siberia. Why is this? Because this region is far away from the Atlantic Ocean and its influences. Study the actual figures for the following places which are arranged in order according to their distance from the Atlantic ocean.

Places.	Longitude.	Mean Jan. Temp.	Mean July Temp.	Mean Annual Range of Temperature.
Valentia (Ireland)	10° W.	45° F.	58° F.	13° F.
Ostend	3° E.	38° ,,	63° ,,	25° ,,
Berlin	13° ,,	31° ,,	64° ,,	33° ,,
Warsaw	21° ,,	24° ,,	66° ,,	42° ,,
Moscow	37½ ,,	13° ,,	66° ,,	53° ,,
Orenburg	55° ,,	4° ,,	71° ,,	67° ,,
Tobolsk	68° ,,	— 2° ,,	66° ,,	68° ,,
Tomsk	85° ,,	— 3° ,,	66° ,,	69° ,,
Yakutsk	129° ,,	— 46° ,,	66° ,,	112° ,,
Verkhoyansk	133° ,,	— 60° ,,	60° ,,	120° ,,

Again note that the climate of the places near the sea-coast in South-eastern Asia is also equable and the range of temperature is not more than 5° F., and that the range increases with the increase of latitude. Colombo has an annual range of 3° F. ; its climate is said to be *equable and hot*, while that of any place on the west coast of Europe is *equable and cool.* Study the following figures. The places are arranged in order according to their distance from the equator.

Places.	Latitude.	Altitude	Mean Jan. Temp.	Mean July Temp.	Mean Annual Range.
Singapore	1° N.	20 ft.	80° F.	82° F.	2° F.
Bankok	13° ,,	0 ,,	76° ,,	81° ,,	5° ,,
Canton	23° ,,	40 ,,	55° ,,	82° ,,	27° ,,
Shanghai	31° ,,	0 ,,	38° ,,	82° ,,	44° ,,
Peking	40° ,,	120 ,,	23° ,,	79° ,,	56° ,,
Urga	47° ,,	4300 ,,	—17° ,,	65° ,,	82° ,,
Irkutsk	52° ,,	540 ,,	— 7° ,,	66° ,,	73° ,,
Yakutsk	61° ,,	330 ,,	—46° ,,	66° ,,	112° ,,
Verkhoyansk	67° ,,	460 ,,	—60° ,,	60° ,,	120° ,,

PRESSURE AND WINDS

You know that pressure of air depends chiefly upon its temperature. Where the temperature of air is high, there its pressure is low; where the temperature is low, there the pressure is high. In July (summer) when the land becomes very hot, a low-pressure area is created over South-western Asia where the temperature is highest (over 90° F.). See Fig. 5. Towards this low pressure centre winds flow from the oceans where the pressure is higher. So the greater part of Eurasia receives inflowing winds in July (Fig. 7). The winds that blow over Europe are the South-west Anti-trades. The winds that blow over India and Indo-China are also *south-westerly*, but these are simply the South-east Trade winds which, having crossed the equator, are deflected to the right by the rotation of the earth. They are southerly and south-easterly in China and Japan respectively: The name *Monsoon* (which means a seasonal wind) is given to these summer winds of S. E. Asia.

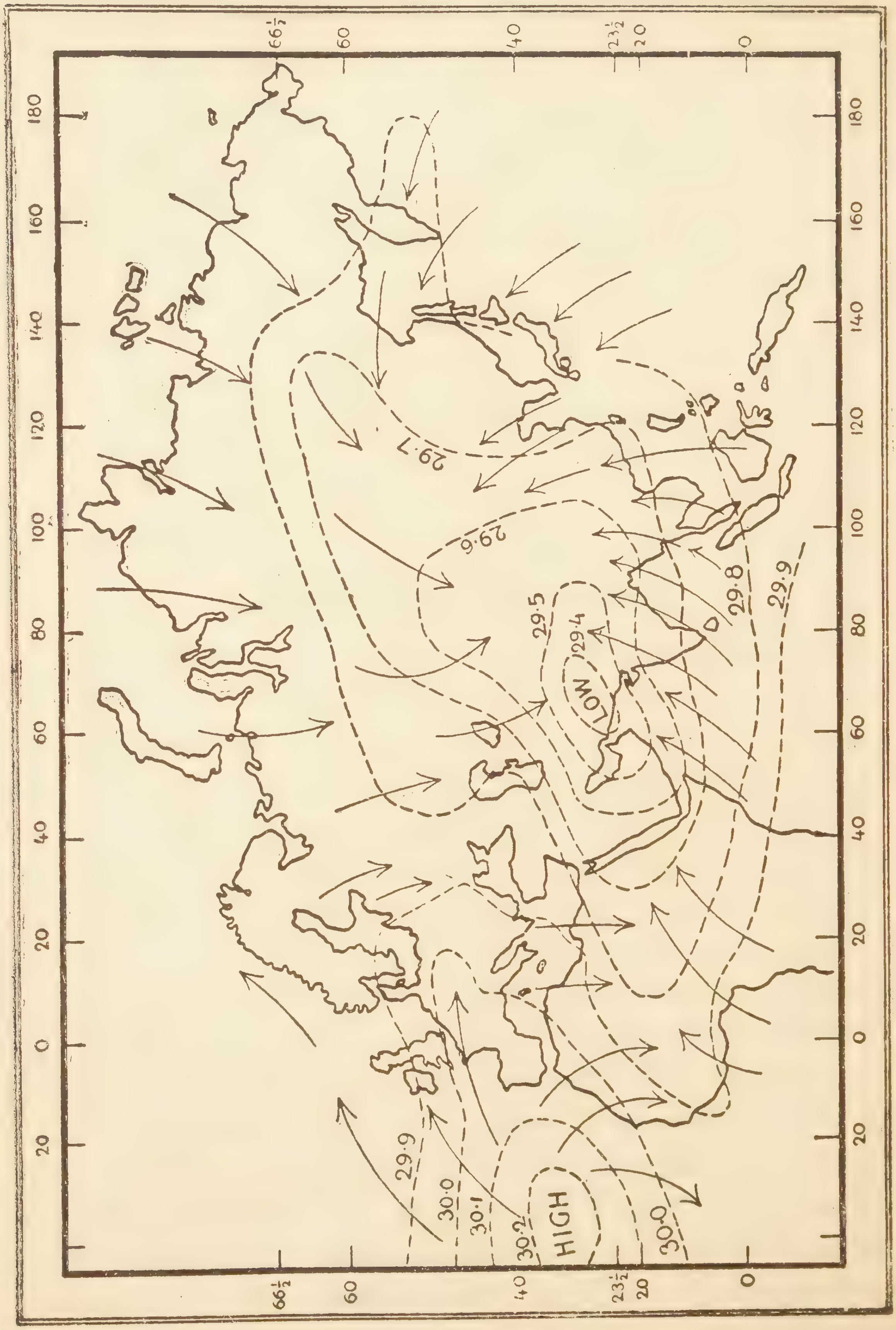


Fig. 7. EURASIA : Pressure and Winds—July.

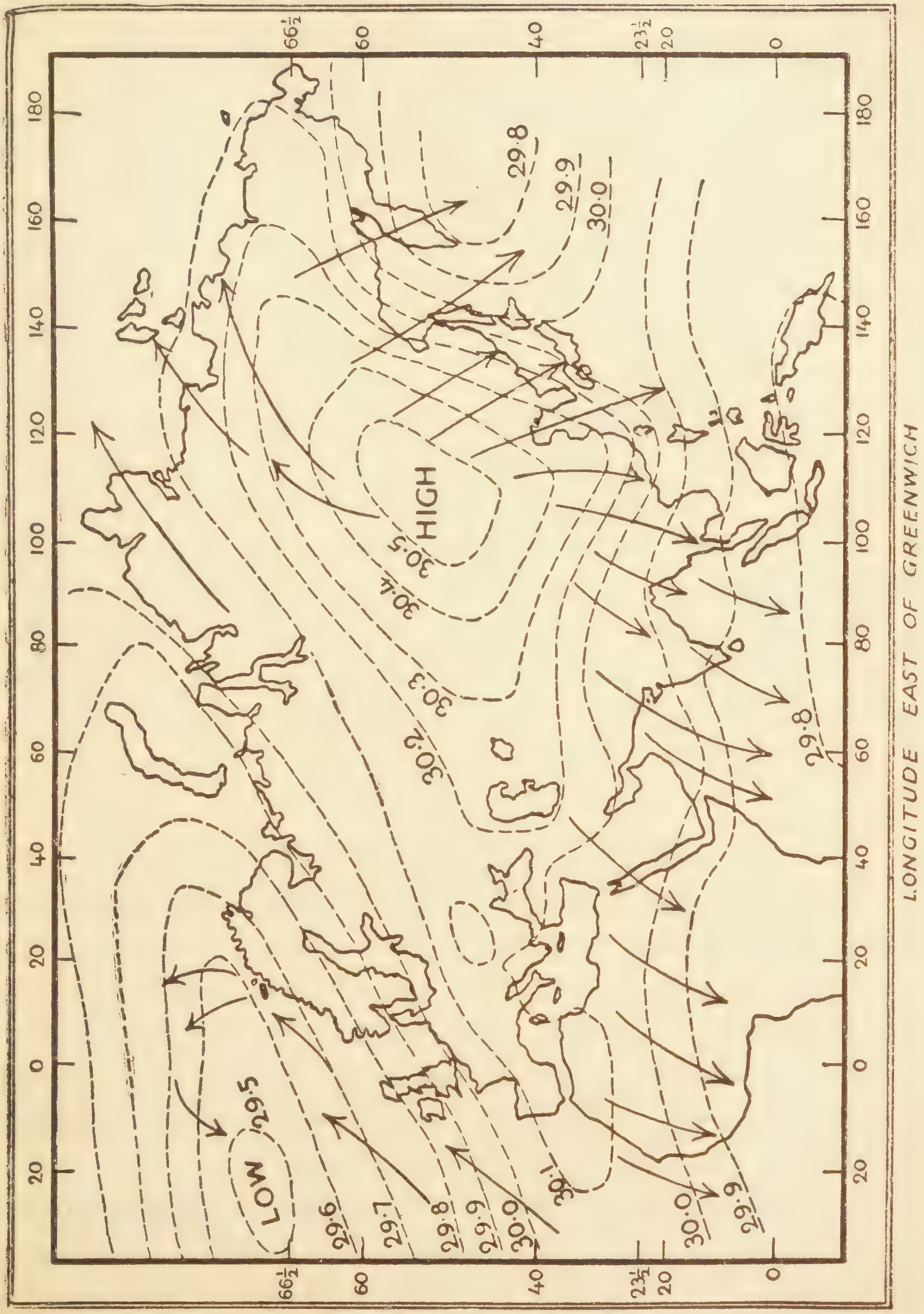


FIG. 8. EURASIA : Pressure and Winds—January.

In January (winter), the land mass in the heart of Asia is extremely cold, and this produces a great high pressure system over Central Asia. (Fig. 8). Over the North Atlantic and Pacific Oceans are well-marked low-pressure areas. From the high-pressure system, winds flow outwards towards the oceans so that the greater part of Eurasia has cold out-flowing winds. Near Iceland there is a low-pressure area ; here the wind-whirl is very active, and cyclonic storms are constantly following one another over the North Atlantic.

In the China Sea (S. E. Asia) cyclonic winds belonging to the class known as hurricanes in the West Indies region are met with. These winds are called '*typhoons*.' Some typhoons travel almost due west and reach the coasts of Indo-China, and others recurve following more or less closely the Kuro Siwo. These are as destructive as the hurricanes of the West Indies area. These originate east of the Philippines which lie right in the track of the winds.

WINDS AND RAINFALL

Summer Conditions (Fig. 9)—**The Monsoons of South-East Asia :**—From the fore-going paragraphs you will find that the shut-up area of South-west Asia with the continent of Africa cutting off oceanic influence, is the hottest part of Eurasia, and is, therefore, a low-pressure area. Winds from the surrounding oceans are drawn in towards this low-pressure centre.

(1) The S. E. Trade winds from the Indian Ocean cross the equator and become the *South-west monsoon* of India and Indo-China. As the movement of the winds is cyclonic, they blow as *Southerly winds* in China, and *South-easterly or Easterly winds* in Japan. As these

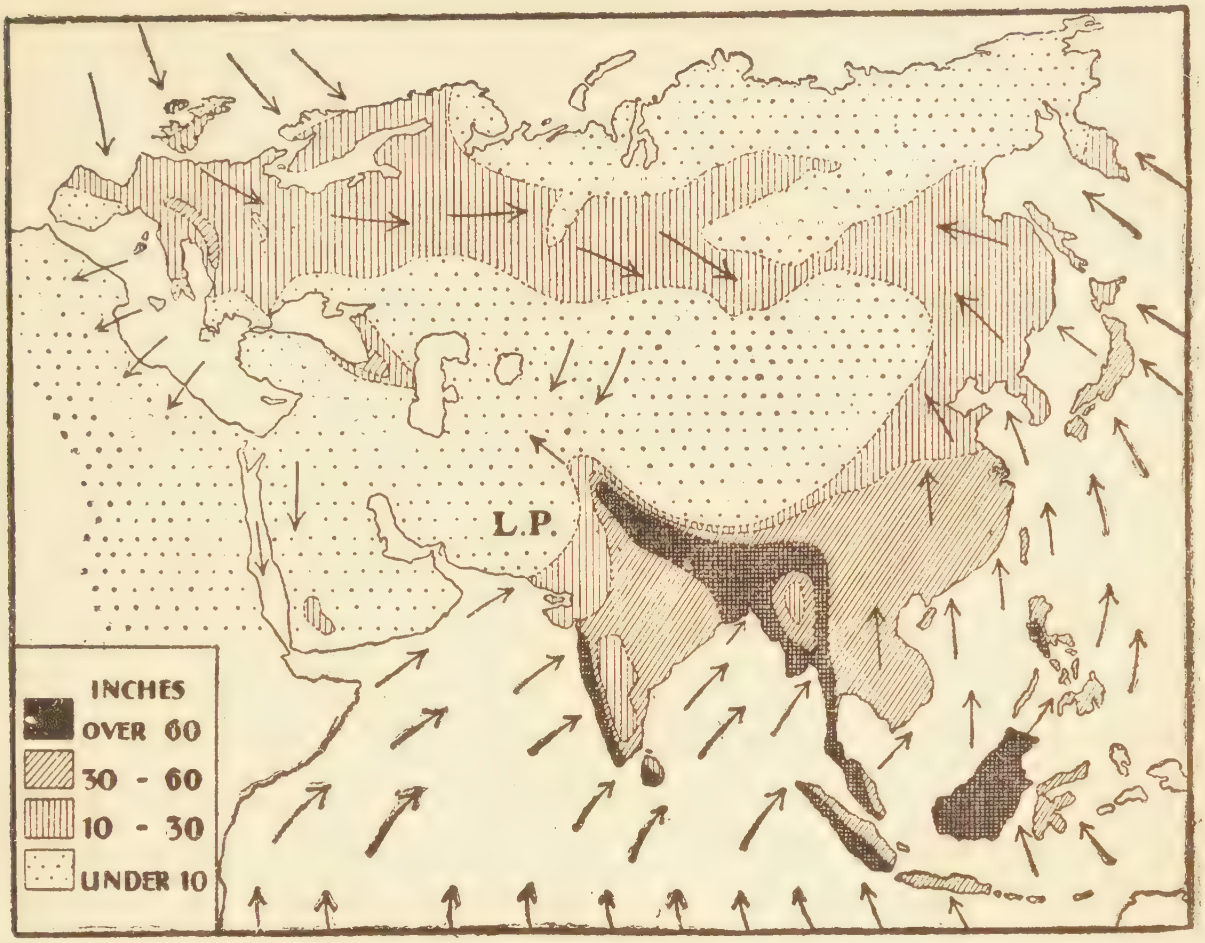


FIG. 9. EURASIA : Rainfall Summer Conditions (1st May to 31st October).

winds cross over vast expanses of ocean they bring plenty of moisture and give heavy rain to the countries of South-east Asia. The influence of these monsoon winds is felt as far north as Kamchatka.

(2) The Central Plateaus of Asia are shut-up areas, and moisture is condensed on the outerside of the mountain walls ; therefore, the rainfall is very scanty.

(3) South-west Asia is cut off from oceanic influence by Africa, and it is outside the influence of the south-west monsoon. So here also the rainfall is very scanty.

(4) In Western Europe the prevailing winds are the south-west anti-trades. These come from the warm regions and pass over the warm Atlantic Drift. Hence

they are moisture-laden winds and give fairly heavy rain to Western Europe.

(5) Owing to the northward migration of the temperature and pressure belts in summer, the south-westerlies blow north of the Mediterranean lands. Therefore countries surrounding the Mediterranean sea have a *dry summer*.

(6) Owing to the comparatively low pressure of the interior of the land, the south-westerlies from the Atlantic Ocean are drawn in across Europe to the Northern Plains of Asia, so that a broad belt stretching across the north of Eurasia experiences *summer* rainfall, but the amount is small, and it gets less from west to east. Berlin, 23″; Warsaw, 22″; Moscow, 21″; Saratov, 15″; Yakutsk 14″.

(7) The Arctic coast-land has no rain, because the low temperature causes very little evaporation to take place.

Note that Sweden and the Deccan are to the *lee* of the Scandinavian mountains and the Western Ghats, respectively; so they are comparatively dry.

Winter Conditions (Fig. 10) :—There is a high-pressure system over Central Asia and winds are of the anti-cyclonic type and blow outward. Hence the interior of the continent has very little rain.

(1) Outflowing winds crossing the Bay of Bengal give rain to south-east India. These are known as the *North-east monsoon*.

(2) Outflowing winds crossing the Japan and Yellow Seas give rain to the western half of Japan and East China.

(3) In Western Europe the prevailing winds are still the south-westerlies as in summer, but the rainfall is greater, because the temperature of the land is lower, and so there is greater condensation of moisture.

(4) Owing to the southward migration of the temper-

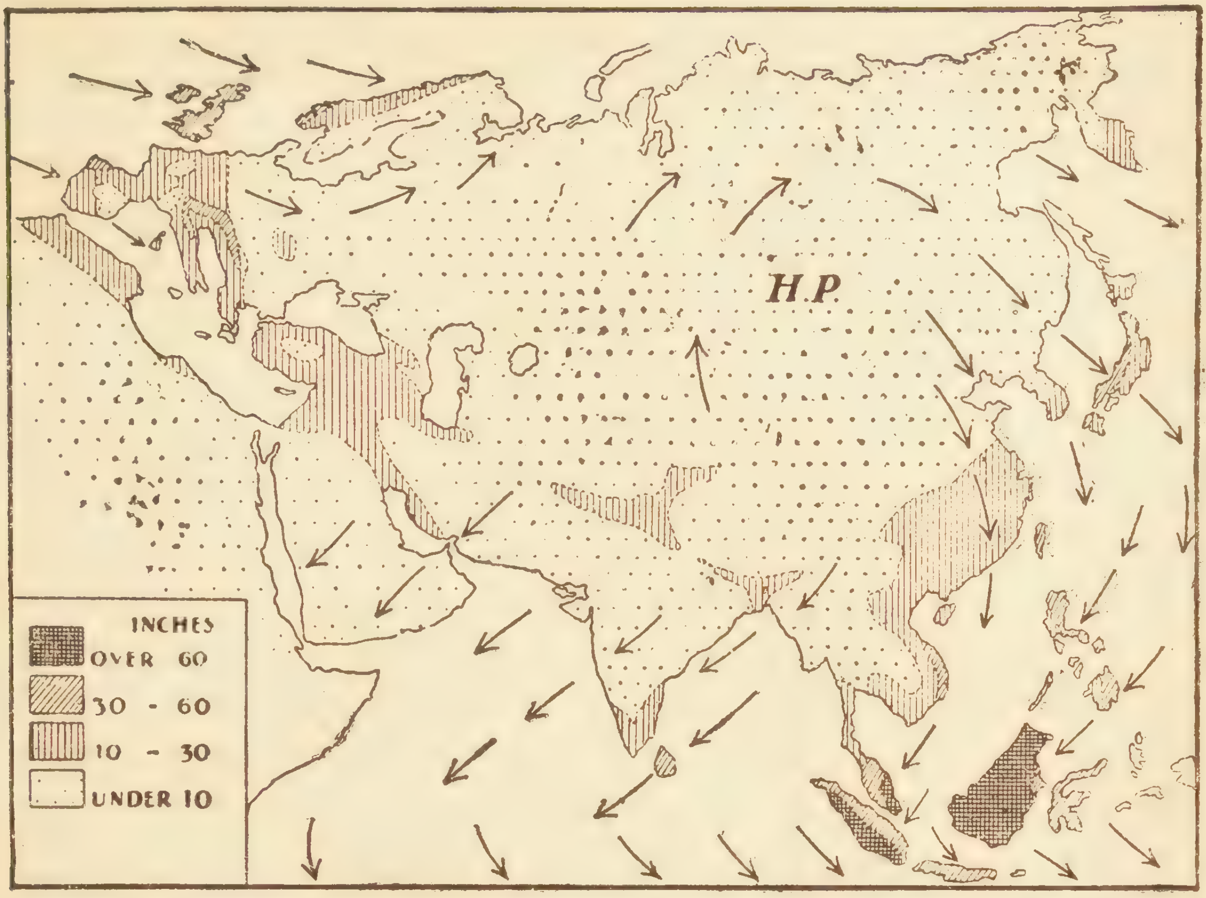


FIG. 10. EURASIA : Rainfall : Winter Conditions (1st November to 30th April).

ature and pressure belts in winter, the south-westerlies shift south and blow over the Mediterranean region. Hence, the Mediterranean countries of Europe, Asia and Africa have a wet winter. This is why *any place having a dry summer and a wet winter is said to have a "Mediterranean" climate.* Recollect what you have already learnt about this.

(5) Ceylon and the Malay Peninsula lie in the path of both the monsoons and so they have rain all the year; the East Indies are in the equatorial belt of constant rains.

Mean Annual Rainfall: Fig. 11 shows the mean Annual Rainfall of Eurasia. Compare the map with a relief map; you will see the connection between the two sets of factors. It is evident in Britain and Scandinavia and also in the monsoon lands.

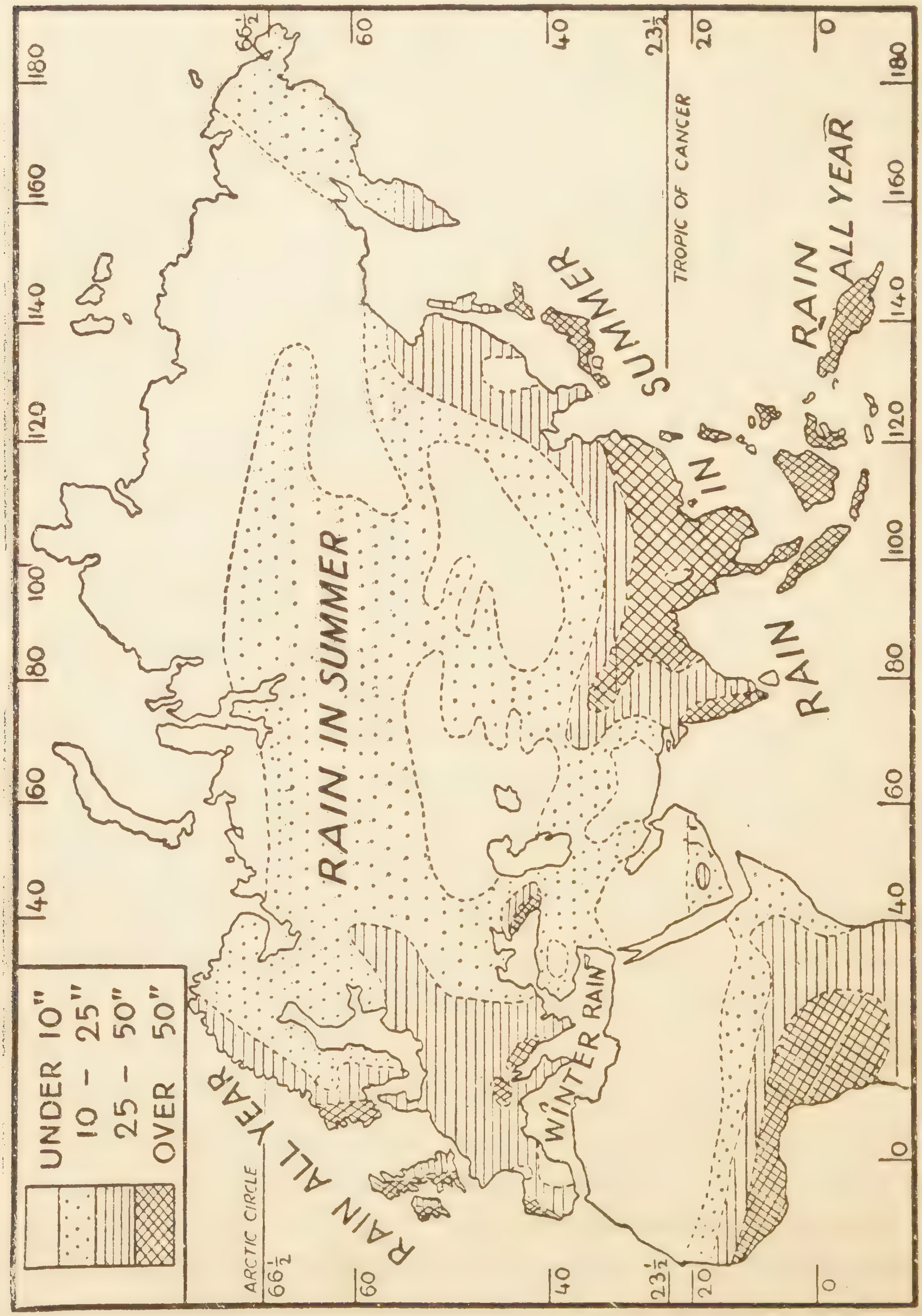


Fig. 11. EURASIA : Mean Annual Rainfall.

North-west Europe has a fairly heavy rain at all seasons; Mediterranean Europe and Asia have rain mostly in winter; a broad band of the Northern Plains gets light rain in summer; south of a line from Karachi to Korea is a region of heavy summer rainfall. Ceylon, the Malay Peninsula and the East Indies have rain at all seasons. The south-western part of the great Northern Plains (*i.e.*, the Aralo-Caspian region), the Central Plateaus, the plateaus of Arabia and Iran and the extreme north have very little rain. It will be seen that the regions of very little rain form nearly two-thirds of Asia.

THE MAJOR CLIMATIC REGIONS OF EURASIA

(See map showing Natural Regions).

(1) North-West Europe: This includes the British Isles and the coastal lands. Here the *summers* are *cool* and the *winters* are *very mild.* Rain falls at all seasons, but most rain falls in *autumn* and *winter* (Oct.—March). In the west of France and the British Isles, the mean January temperature exceeds 40° F.; at Brest it is 43° F. Note the rainfall in inches of the following places:—

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Brest (France)	3·3	3·0	2·2	2·1	1·9	2·0	2·1	2·1	3·1	3·6	3·8	3·2
Brussels (Belgium)	2·2	1·8	2·0	1·7	2·3	2·5	3·1	3·1	2·7	2·9	2·7	2·6
Bergen (Norway)	6·9	5·6	4·3	3·8	4·1	4·4	5 9	6·9	8·3	8·8	6·7	7·4

Compare this region with British Columbia and South Chile.

(2) Central Europe: This includes Eastern France, Germany, Switzerland and the Danubian Provinces. The *summers* are *warm*, and the *winters* are *cold*. Most *rain* falls in *summer* (May—Oct.). This is the transition region between the oceanic N. W. Europe and the Continental Eastern Europe. In winter the temperature decreases from west to east. In Central Germany, Austria, Hungary and Rumanina temperatures below zero occur in most winters. The hottest part in Central Europe in summer is Hungary. In the Alpine region, temperature is modified by altitude. Study the following figures :

Towns.	Altitude.	Temperature coolest months.	Temperature warmest months.	Range.
Lyons (E. France)	574 ft.	36° F.	70° F.	34° F.
Stettin (Gerany)	98 ,,	31° ,,	65° ,,	34° ,,
St. Gothard	6877 ,,	18° ,,	46° ,,	28° ,,
Vienna (Austria)	656 ,,	29° ,,	67° ,,	38° ,,
Buda—Pest (Hungary)	509 ,,	28° ,,	70° ,,	42°

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Lyons	1·3	1·4	2·1	2·6	3·3	3·3	3·4	3·3	3·0	3·8	2·6	1·9
Berlin	1·5	1·5	1·9	1·4	1·7	2·5	2·7	2·2	1·7	2·0	1·9	1·9
Vienna	1·4	1·3	1·8	2·0	2·8	2·8	2·8	2·8	1·7	1·9	1·6	1·7

(3) The Mediterranean Region : This includes not only the countries of Europe bordering the Mediterranean, but also the Black Sea and the Mediterranean shores of Asia Minor, Syria and Palestine. The Mediterranean climate has three main characteristics : (1) most of the *rain* falls in the *winter-half* of the year, and there is more or less complete *drought in summer.* (2) The winters are very mild, the coldest month having a mean temperature above 40° F. Summers are very hot, the mean July temperature exceeding 70° F. (3) The skies are bright and sunny, the summer being almost cloudless. Marseilles: Jan., 43° F ; July, 72° F. Gibralter: Jan., 54° F ; July, 74° F ; Smyrna: Jan., 46° F ; July, 80° F. The region of heaviest rainfall is on the east coast of the

Adriatic sea, and that of least rainfall is in the south of Spain.

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Marseilles	1·8	1·3	1·6	1·9	1·7	1·1	0·6	1·1	2·0	3·5	2·8	2·1
Rome	3·1	2·4	2·7	2·6	2·2	1·5	0·7	1·1	2·9	4·5	4·4	3·6
Constantinople	3·4	2·7	2·4	1·7	1·2	1·3	1·1	1·7	2·0	2·5	4·0	4·8.

Compare this with California, Middle Chile, Cape District, South-west Australia.

(4) **South-west Asia:** This includes Central Asia Minor, Arabia, Mesopotamia, Persia, Afghanistan, Baluchistan and the Lower Indus Basin. The *summers* are *hot*, the heat being great even on the plateaus ; it is hot during the day and comfortably cool at night. The air is dry and the sky almost cloudless. The winters are cool or cold, coldest in the highlands of Asia Minor and Iran, the temperature frequently falling far below freezing point at night. The rain is scanty, and falls entirely in the winter months except in the Lower Indus Basin which has its maximum rain in July. The scanty rain is due to the fact that Arabia and the Lower Indus valley are off the track of the monsoons, and the plateaus are shut up. Arabia and the Lower Indus Basin are deserts like the Sahara. Compare the temperatures and rainfall of the places given below :—

Places.	Altitude in feet.	January Temperature.	July Temperature.	Range of Temperature.
Aden	94	76° F	89° F.	13° F.
Bagdad	220	49° ,,	93° ,,	44° ,,
Teheren	4002	34° ,,	85° ,,	51° ,,

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Aden	0·3	0·2	0·7	0·3	0·2	0	0	0·1	0·2	0	0·1	0·1	2·3
Bagdad	1·3	2·1	1·6	0·9	0·2	0	0	0·1	0	0	1·0	1·8	9·0
Teheren	1·2	0·9	2·4	0·9	0·4	0	0	4·0	0·1	0·1	1·2	1·3	8·9

Compare this with the Great Basin and Colorado Plateau of N. America.

(5) The Heart of Asia or the Central Plateaus: This includes the vast arid tract extending for some 2,000 miles from the Pamirs to the Khingan Mountains. Except Tibet, the other portions form really a great basin, or rather a series of basins. This region resembles S. W. Asia in aridity so that it is often considered as a continuation of the deserts of N. Africa and Arabia; but there is much difference in the temperature conditions owing to altitude and latitude. S. W. Asia lies south of 40° N. Lat., while the Heart of Asia lies between 37° N. and 50° N. Lat. The Tarim Basin has the Takla Makan desert, and the Mongolian Plateau has the Gobi or Shamo desert. The high mountain wall of the Himalayas in the south shuts off this area from rain-bearing winds. The mountains in the north and west, though lower, are high enough to ward off the winds from those quarters. But in the east moist winds penetrate so that there is a belt of good steppe land along the south-east border of the Gobi.

Places.	Altitude in feet.	January Temperature.	July Temperature.	Range of Temperature.
Kashgar	4,255	22° F	80° F	58° F
Urga	3,800	15° F	64° F	79° F

Note that the seasonal range of temperature is very great owing to the high latitude of the region.

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Kashgar	0·3	0	0·2	0·2	0·8	0·4	0·3	0·7	0·3	0	0	0·2	3·5

Urga has a total annual rainfall of 7 inches.

(6) The Northern and Central Eurasian Plains: This includes some of the Baltic Provinces and the whole of the Russian Empire. The climate is essentially continental. In winter the warm Atlantic Drift is a more important source of heat than direct insolation. The prevailing westerly winds carry the oceanic influence far inland. But every mile we advance towards the north-east, the colder it becomes. We have already referred to the 'Cold Pole' of the earth being situated at Verkhoyansk in East Siberia. The heat of the North Atlantic is more than 3,000 miles distant; the Pacific Ocean has not much effect, since the wind blows off-shore; the Arctic being ice-covered cannot have any moderating influence; the warm Indian Ocean lies far to the south of the mountain barriers of Central Asia. The whole of this region has a mean January temperature below freezing point. (See fig. 4). But the Siberian winter is not so unpleasant as the low temperatures might suggest; for the air is said to be very dry.

In summer the whole area is warm, the 50° isotherm line forming the southern boundary of the tundra region. The highest temperatures occur in the deserts of the south, the south of Turan having a July mean of 86° F. The range of temperature is high and increases from west to east. (See Fig. 6).

Summer is the rainiest season, July and August having the maximum rainfall. In a wide belt extending through Central Russia and South Siberia, the rainfall is moderate, about 20 inches in the west, and over 20 inches in the extreme east where it is brought by the S. E. monsoon; the central part of this belt has about 15 inches. North and south of this belt, the rainfall is less. The driest region includes the deserts of Turan which have less than 4 inches. Between the desert and the central belt are the steppes with rain ranging from 8 to 15 inches. These are treeless plains, for the insufficient rain, the loose soil and the strong winds are all inimical to tree growth. In winter the precipitation is in the form of snow.

What peculiarity do you find in the July and January temperatures (°F) of the following places?

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Moscow	12	15	23	38	53	62	66	63	52	40	28	17
Tobolsk	—2	5	15	33	48	60	66	60	48	33	14	2
Yakutsk	—46	—35	—10	16	41	59	66	60	42	16	—21	—41

Compare this area with the interior of Canada.

(7) **The Monsoon Lands:** These include India, Indo-China, China and Japan. These are lands of *hot, wet summers* and *dry winters.* There is such a great difference between the temperatures of the northern and southern parts of this region that we must divide it into (1) *a temperate region,* (2) *a sub-tropical or warm-temperate region*, and (3) *a tropical region.*

(1) The first region has cold winters like the St. Lawrence region of N. America. It includes the plains of Manchuria, and N. China, and the islands of Sakhalin and Yezo. Summer is the normal season of most rain. This region on the eastern margin of Eurasia differs from N. W. Europe on the western margin in three respects: (i) The winters are colder and summers are slightly warmer. (ii) The mean annual rainfall is less. (iii) The rivers and harbours are frozen in winter.

(2) The second region which includes Northern and Central China, Korea and Japan, has warmer winters than the first, and has a heavier and more evenly distributed rainfall. This region corresponds to S. E. United States. It differs from the Mediterranean region on the western margin in having its heaviest rainfall in summer. The corresponding regions in the Southern Hemisphere are S. E. Brazil and Uruguay, Natal and the Coastal margin of New South Wales.

(3) The third region which is very hot in summer and very warm or hot in winter, includes India, Indo-China and Southern China. These are typical monsoon countries. As in the first two regions, most rain falls in summer. Very similar climatic conditions are found in Central America and West Indies, Eastern Brazil, Madagascar, Mozambique and Northern Australia.

Study the following figures :—

No.	Towns.	Lat.	Temp. coldest month.	Temp. warmest month.	Mean Annual Rainfall.
1	Vladivostok	43° N.	5° F.	69° F.	15 ins.
	Peking	40° ,,	23° ,,	79° ,,	25 ,,
2	Tokyo	35° ,,	37° ,,	78° ,,	62 ,,
	Hankow	30° ,,	38° ,,	83° ,,	51 ,,
3	Canton	23° ,,	55° ,,	83° ,,	66 ,,
	Hue	16° ,,	67° ,,	85° ,,	102 ,,

Compare the rainfall (in inches) of :—

No.	Towns.	Dec. to Feb.	March to May.	June to Aug.	Sept. to Nov.	Total.
1	Mukden	0·6	4·0	14·2	4·8	23·6
2	Shanghai	5·7	10·9	17·9	9·6	44·1
3	Hong Kong	3·3	21·1	47·0	18·8	90·2

The figures 1, 2, 3 refer to the three regions respectively. Note that (1) in all the places most rain falls in summer, and (2) that in the south the rainfall is heavier than in the north.

(8) **The South-Eastern Peninsula and Islands:** This region includes Ceylon, the East Indies, the Philippines, and the southern portion of the Malay Peninsula. A high temperature and abundant rainfall at all seasons

are its characteristic climatic conditions. Like the Amazon and Congo Basins, this region is of the Equatorial type :—

Places.	Coldest month.	Warmest month.	Range.
Penang	79° F.	82° F.	3° F.
Singapore	78° ,,	82° ,,	4° ,,
Batavia (Java)	78° ,,	80° ,,	2° ,,

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Penang	3·9	3·0	4·7	7·0	**11·0**	7·2	8·9	12·8	**19·0**	16·1	10·9	4·8	109·3
Singapore	8·5	6·1	6·5	6·9	7·2	6·7	6·8	8·5	7·1	8·2	10·0	10·4	92·9
Batavia	13·0	13·6	7·8	4·8	3·7	3·6	2·6	1·3	2·6	4·1	5·0	8·7	70·9

Note the *double rainfall maximum* of Penang, and the uniformly heavy rainfall of Singapore. In which months has Batavia the heaviest rainfall ? Why ?

EXERCISES

(1) Why are the January and July isotherms of Europe called "sea" and "sun" lines respectively ?

(2) What is meant by the "cold pole"? Where is it ? Why is it there ?

(3) 'Eastern Siberia is colder than Western Europe in the corresponding latitudes.' Why ?

(4) What do you learn from the first table of figures given under "Mean Annual Range of Temperature" ?

(5) What conditions characterise a **Continental** climate ? Are such conditions found in Asia ?

(6) What are '**Monsoons**'? How are the monsoons of S. E. Asia caused ?

(7) How does the **S. W. Monsoon** differ from the **S. W. Anti-trades** ?

(8) Why are the following regions rainless: (1) Arabia, (2) Tarim Basin, (3) Tundra ?

(9) Why does the Mediterranean region have rain only in winter ?

(10) Draw a map of Eurasia and shade it according to the seasonal distribution of rainfall.

(11) Draw a diagram to show the mean monthly temperatures of Moscow, Tobolsk and Yakutsk. What do you learn regarding their summer and winter temperatures?

(12) Represent graphically the mean monthly rainfall of (1) Bergen, (2) Marseilles, (3) Aden, (4) Singapore.
Tell how you can learn from the graph the region in which each is located.

(13) 'In Western Siberia there are four different rainfall belts.' Mention them.

(14) "The Monsoon Lands fall into three climatic subdivisions." What are the characteristics of each region?

(15) Why has Penang a double rainfall maximum?

CHAPTER III

VEGETATION, ANIMALS, NATURAL REGIONS, PEOPLES AND POPULATION

NATURAL VEGETATION

Figure 12 shows the distribution of Natural Vegetation in Eurasia. In studying it constant reference should be made to the Temperature and Mean Annual Rainfall maps so that the connection between temperature, rainfall and natural vegetation may be clearly understood.

(1) **The Tundra or the Cold Desert:** This is met with along the Arctic coast of Eurasia, its southern limit being approximately the July isotherm of 50° F. Here the winters are long and severe, and the summers are short and warm. The total precipitation is less than 10 inches per annum. The ground is perpetually covered with snow, only the upper layer thawing for a few weeks in summer. Such conditions are not favourable to the growth of vegetation. Mosses, lichens, and small berry-bearing plants and shrubs are the only vegetation.

(2) **The Coniferous Forest:** South of the tundra lies a broad belt of coniferous forest extending from Scandinavia right across Finland, North Russia and Siberia up to Kamchatka. The chief trees are firs, pines, larches and spruce with their needle-like leaves. Here the summer temperature is low and the rainfall is scanty; the winter is intensely cold and the ground is covered with snow. In spring as this snow slowly melts, the moisture saturates the ground and the conditions are ideal for the growth of trees. The forest of Siberia is called the *taiga*, and here lumbering is as yet in the initial stage.

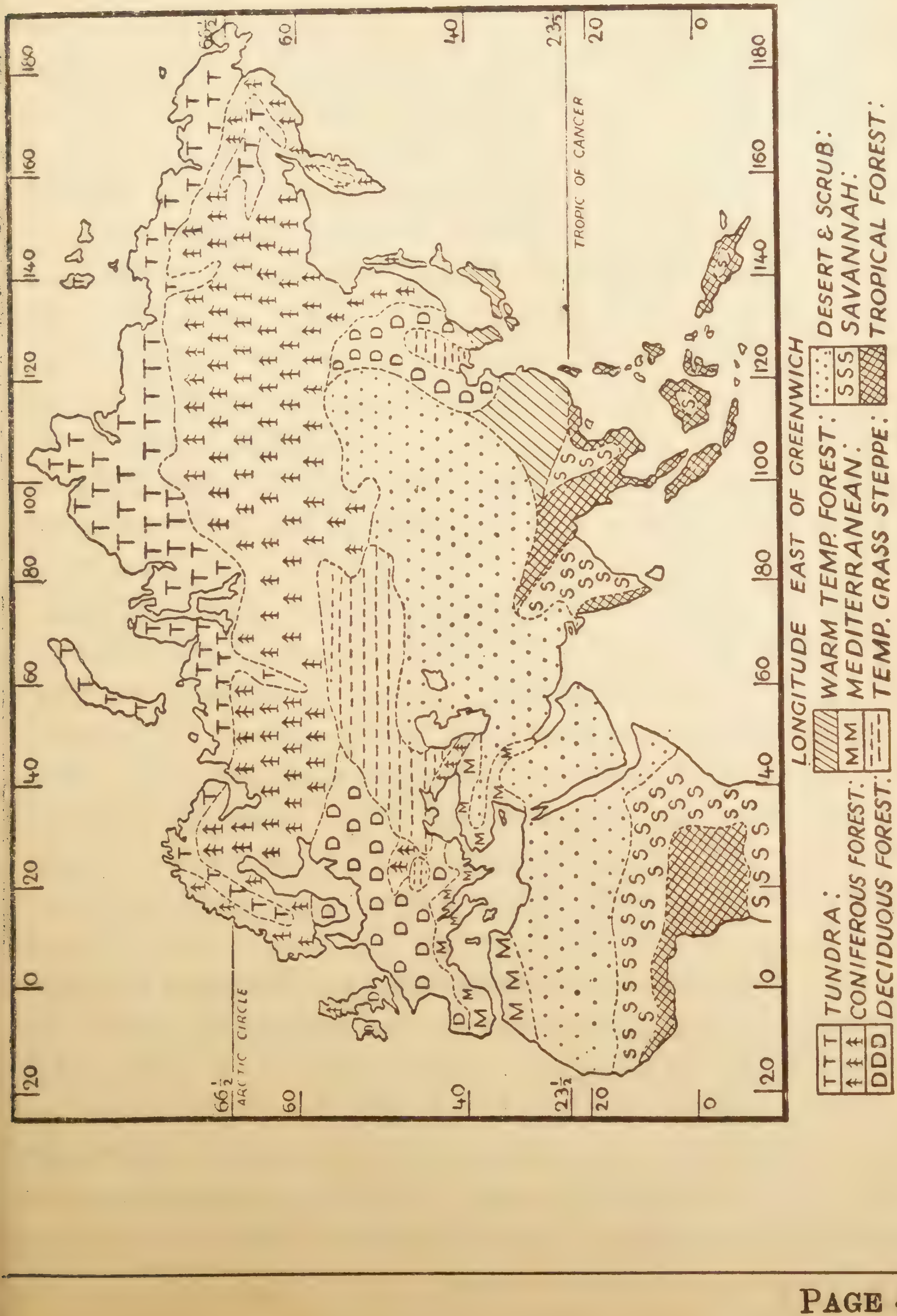


FIG. 12. EURASIA: Natural Vegetation

(3) **The Deciduous or Broad-leaved Forest:** The chief trees in this forest are the oak, beech and elm. This forest covers most of the Atlantic sea-board and Western Europe, and Amuria, Manchuria and North China on the Pacific border. The trees shed their leaves in autumn. The climatic factors are an equable temperature and fairly abundant rainfall. From the greater part of Western Europe the natural deciduous forests have been removed, and the land has been brought under cultivation.

(4) **The Mediterranean Region:** This, as you know, is a region of winter rainfall and summer drought. So the vegetation is of the kind capable of resisting the summer drought. Which other parts of the world have this kind of vegetation? The cork oak, walnut, laurel and myrtle are the typical trees; all of them are evergreens. In most of this region, vines, olives and mulberries are cultivated.

(5) **The Warm Temperate Forest:** This is found on the eastern margin of the continent and covers Central China and Japan. This is a region of summer rainfall, while its counter part on the western margin (*i. e.*, the Mediterranean area) is a region of winter rainfall. Here also the forests are evergreen, and the leaves of the trees are large and thick. A large part of this region now forms important agricultural lands where rice, sugar, tea and cotton are grown.

(6) **Temperate Grasslands or Steppes:** Here the summer is very warm and the winter very cold; and the rainfall in summer is too scanty to favour the growth of trees. Such a region is generally met with in the interior of great land masses. The prevailing vegetation everywhere is grass as in the prairies or the pampas. This zone extends over the Plain of Hungary, Southern Russia,

and the basins of the Upper Ob, Tobol and Yenisei. This is a region of grazing animals. This region lies between the forests of the north and the semi-desert of the Aralo-Caspian Basin. Where rainfall is sufficient and soil is good (as in the Black Earth region) cereals are grown. In fact the richer grass lands are rapidly becoming important wheat-producing lands.

(7) **Desert and Semi-Desert:** Towards the Caspian and Aral Seas the Steppe merges into semi-desert or scrub-lands. True deserts are found in the rainless parts of Turan, Arabia, Iran, Tibet and Mongolia. In the higher parts of Arabia and over considerable portions of the central plateaus are tracts of slight rainfall forming poor pasture lands. In the Aral Basin there are fertile irrigated strips along the rivers; but on deserts there are very few plants except where there are underground supplies of water. Desert plants have either long roots or fleshy leaves. Very often the leaves are small and protected by means of thorns, so that they are able to resist the evaporation of moisture from the plant. On the edges of the desert trees exuding gum are found, *e. g.*, the acacia. The date palm is important in Arabia and Southern Mesopotamia.

(8) **The Hot Grassland or Savannah:** This is found in places which have warm dry winters and hot summers, with a small rainfall in summer. This is part of the monsoon lands, the Deccan forming an example of this type. As the rainfall is not sufficient to keep the soil moist all the year round, trees cannot grow except near rivers.

(9) **The Hot Wet or Tropical Forests:** These include the equatorial forests and the monsoon rain forests. The former type is found in the Malay Peninsula and the East Indies where temperature is high and rainfall is

constant; while the latter is met with in parts of India, Indo-China and South China where the summer monsoon rain is so heavy as to keep the soil moist at all seasons. Teak, bamboo, rubber, sago-palms, cocoanut palms, bananas, cacao and spices are typical of this region. Tropical forests differ from temperate forests in two respects: (1) They have a dense under growth, and so the clearing of a tropical forest is more difficult than clearing a temperate forest. (2) In a tropical forest, trees of the same species are not found together, but lie scattered, for the thick undergrowth prevents the seeds of a particular tree from taking root near it; but in the temperate forests trees of the same species may cover a large continuous area, so that we can meet with a pine, fir, oak or beech forest. We cannot have rubber, cacao or teak forests, but can have plantations where trees of the same species are planted in neat rows by man. Much of the dense jungle of Malaya has been cleared, and there are now many rich rubber plantations in that country.

(10) High Mountain Flora: You have already learnt in connection with the Andes, that climate and vegetation vary with altitude, so that in ascending a high mountain near the equator a man sees the same changes in vegetation as he sees in a journey from the equator to the polar regions. The dense equatorial forests at the base of the mountains (*e. g.*, Himalayas) give way gradually to evergreen, warm temperate, deciduous and coniferous forests. Above these levels grass and flowering plants, are found; next comes the tundra and lastly everlasting snow. On the Scandinavian highlands in Europe, the elevation and the high latitude make it possible only for the vegetation of the tundra type to exist. Mountains of moderate elevation like the Carpathians are forested to their summits;

while in the higher Alps and Caucasus, mountain pastures, tundra vegetation and everlasting snow are met with. Fig. 13 illustrates the changes of vegetation according to *latitude* and *altitude*.

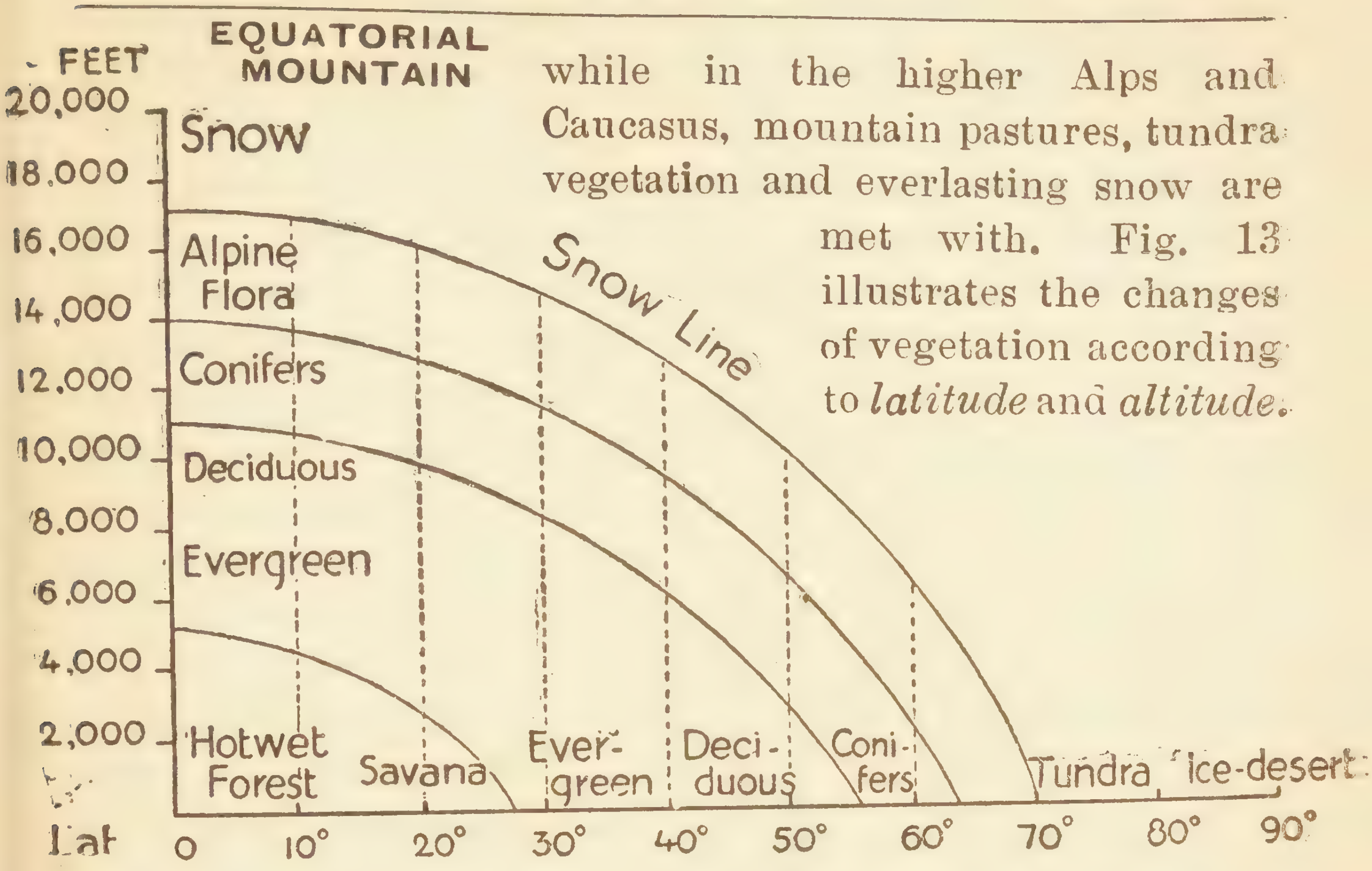


FIG. 13. Diagram showing changes in the Belts of Vegetation according to Latitude and Altitude.

ANIMALS

The chief animal of the tundra is the reindeer (Fig. 14) which lives upon mosses and lichens. It is as important in the cold desert as the camel is in the hot desert. It draws sledges and provides food and clothing to the inhabitants. The forests of Siberia give shelter to many kinds of fur-bearing

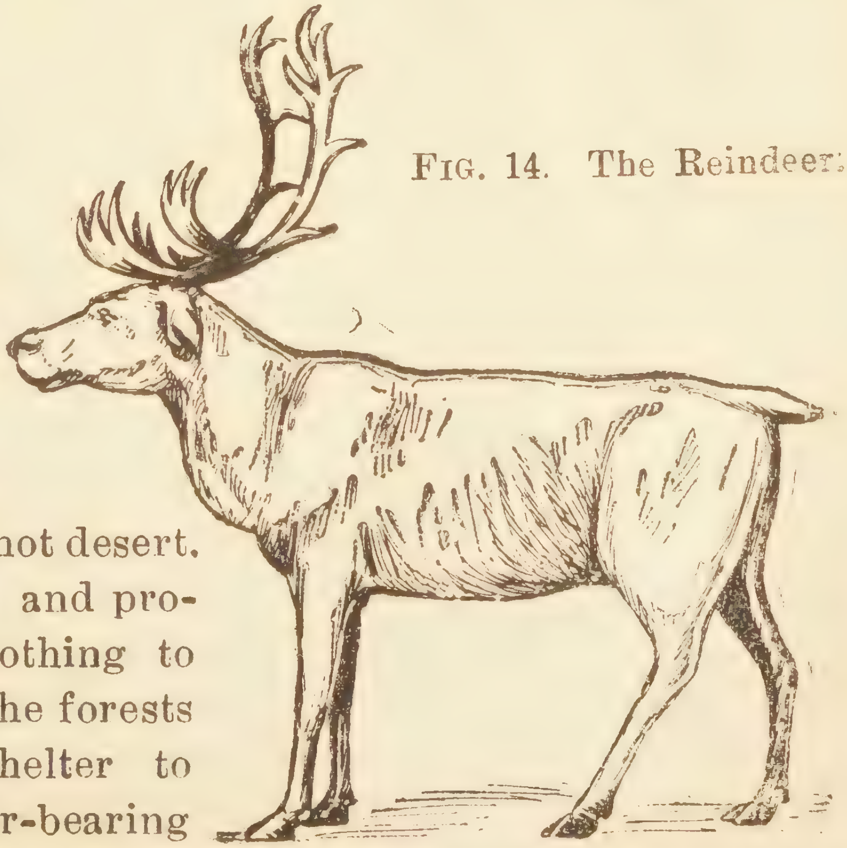


FIG. 14. The Reindeer.

animals, of which the chief are the sable, fox, minx and ermine.

In the steppes, horses, asses, cattle, sheep and goats find luxuriant grazing. The most useful animal to the dwellers of the semi-desert and desert is the camel which is found wild in Central Asia. No other animal is so well adapted to live in dry lands where little water and grass are to be obtained. The one-humped as well as the two-humped species of camel are found in Asia. In Arabia the chief animal is the camel, but the famous Arab horses are reared on the poor pastures.

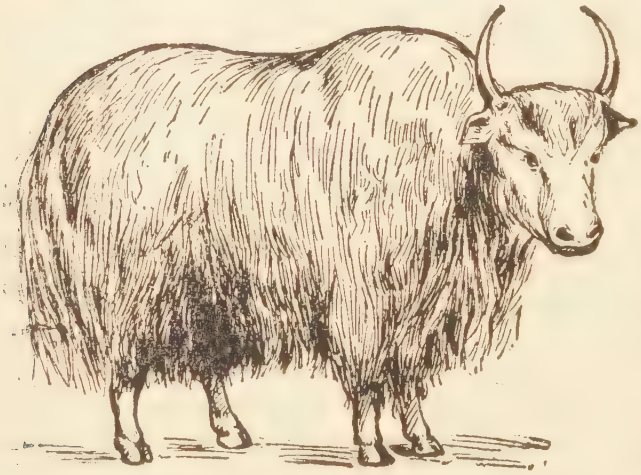


FIG. 15. The Yak.

The yak (Fig. 15), a kind of ox, is as important to the Tibetan as the reindeer is to the people of the tundra. As a beast of burden, it is very sure-footed and can ascend to a height of 20,000 ft. It is a heavily-built creature covered with long black hair which is spun into ropes or tent-coverings. It also provides food and clothing.

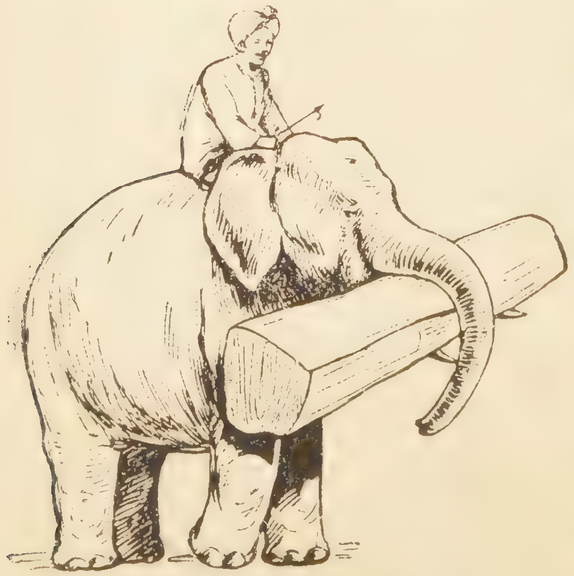


FIG. 15a. The Indian Elephant.

In the monsoon lands animal life is as varied and prolific as vegetable life. In the jungles of Southern and South-east Asia are found the tiger, leopard, hyena, bear and various kinds of poisonous snakes. The elephant (Fig. 15a) of India and Indo-China has been domesticated, and is largely employed to pile up logs of wood in the timber depots. The tapir (Fig. 10, S. America) "a humble cousin of the elephant," is confined in Asia to the Malay Peninsula and Sumatra. The most useful animals of draught are the Indian buffaloes and humped cattle.

The dairycattle of Switzerland, Denmark and the Netherlands, the sheep of the black lands of Central Europe and the goats of the drier pastures of Iberia and Anatolia are also important.

The North Sea, the coast of Norway, the Japan Sea and the Coast of Manchuria are the chief fishing grounds. The Bering Strait and the Sea of Okotsk are famous for seals and whales.

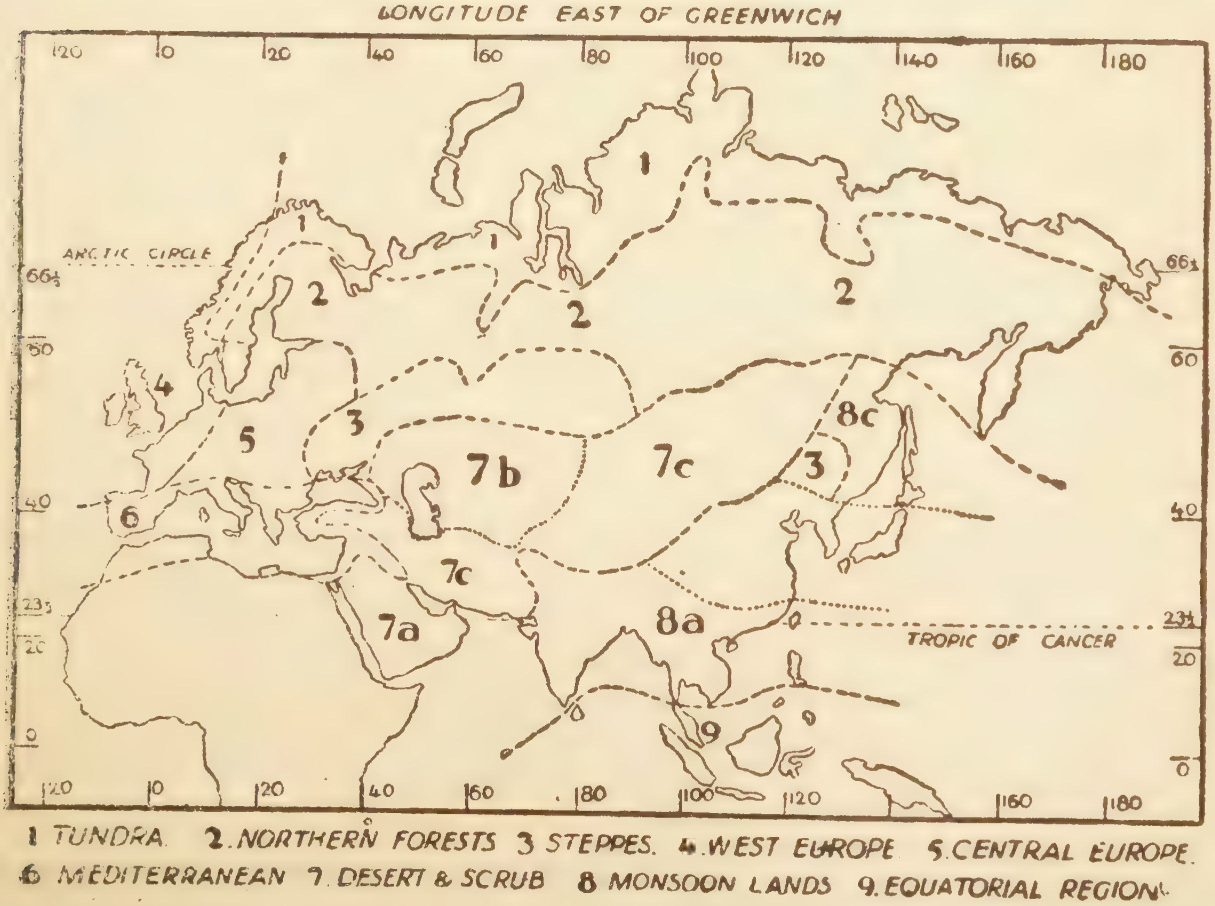


FIG. 16. EURASIA: Natural Regions.

NATURAL REGIONS (Fig. 16)

You have already learnt what a natural region is. Eurasia can be divided into the following natural regions and it is to be noted that the natural regions are simply the climatic regions with their sub-divisions.

Natural Regions	Climatic Conditions.	Vegetable Life and Occupation.
(1) The Tundra.	Very low temperature and snowfall.	Mosses and lichens. Occupation: hunting, fishing and herding of reindeer.
(2) The Northern Forests.	Long and severe winters and short warm summers; extreme; scanty rainfall, most in summer.	Coniferous forests—lumbering in accessible parts—hunting and trapping fur-animals.
(3) The Steppes.	Extreme climate—long severe winter and very warm summer. Rainfall not heavy, most in summer.	Grass: Stock-rearing natural occupation, now giving place to wheat-growing.
(4) Western Europe.	Mild and equable temperature; rain all the year, most in autumn and winter.	Natural vegetation; deciduous forest with conifers on the higher and colder parts. Forests now cleared and land extensively used for cultivation of cereals, fruits and root-crops. Industrial development in coal areas.
(5) Central Europe.	Summers warmer and winters colder than in (4). Rain at all seasons, but more in summer than in winter.	Do.
(6) The Mediterranean Region.	Mild rainy winter and warm dry summer.	Evergreen forests and luscious fruits; wheat also grown.

Natural Regions.	Climatic Conditions.	Vegetable Life and Occupation.
(7) Deserts and semi-deserts:		
(a) Arabia and Thar.	Very hot; great daily range of temperature; practically no rain	Desert, some vegetation in oases.
(b) Interior lowlands of Turan.	Very extreme; scanty rain chiefly in summer.	Varying with rainfall; rich grass or poor grass and thorny scrub; nomadic life except in irrigated areas.
(c) Interior highlands, Iran and Central Plateaus	Very extreme; very scanty rain; central plateaus having much colder winters and being drier than Iran.	Do.
(8) The monsoon lands:	Tropical;	
(a) India, Indo-China and South China.	Very hot summer and very warm or hot winter; heavy rain, all in summer.	Tropical forests on windward slopes and savannahs on leeward areas.
(b) Central and Northern China and Japan.	Warm temperate; extreme, winter colder than in (a); most rain in summer.	Warm temperate evergreen forests, and deciduous forests.
(c) The extreme north.	Cool temperate; moderately extreme; cold winters; most rain in summer.	Deciduous and coniferous forests (the lowlands of Manchuria excepted) a & b form extensive agricultural areas.
(9) Equatorial Region.	Hot and equable; heavy rain at all seasons.	Equatorial forests: Cacao, rubber, rice and sugar cultivated in the clearings.

PEOPLES

The inhabitants of the world have been grouped under the three races: (1) *the Caucasian or White race*, (2) *the Mongolian or Yellow race*, (3) *the Negro or Black race*.

The Caucasians have a fair skin, straight-set eyes with varying hue—blue, grey, brown or black, and an abundance of hair, often long and wavy. The men generally have beards. To this group belong most of the inhabitants of Europe and of western Asia. The Georgians of the Caucasus region, the Semites of Arabia and Syria, the Armenians and Iranians and people of North India speaking an Aryan language come under this group.

Caucasian.

Mongolian.

Negro.

The European peoples have been divided into three main races:

(1) *The Northern or Nordic race*, found in parts of England, Scandinavia, Denmark and the north German plain. They are distinguished by their tall stature, fair complexion, and blue or light-coloured eyes. (2) *The Mediterranean race*, whose physical characteristics are long, oval faces, short stature and a dark complexion. Their heads are long compared with their breadth. They occupy the Mediterranean region—Spain, Southern France, Southern Italy, etc. (3) *The Alpine race*, occupying the country lying between that of the two races mentioned above. They are found in the Highlands of Central Europe and over the greater part of the Russian plain. They are distinguished by their broad heads, and in other

features they are intermediate between the Nordic and Mediterranean races. There has been much admixture of Nordic and Alpine peoples.

The Mongolians have a yellow skin, oblique eyes and prominent cheek bones. There are two classes : (1) The *Northern* Mongolians : the tribes inhabiting northern and southern Siberia and Turkestan, the Japanese and Koreans, Manchus and the natives of Mongolia all belong to this class. (2) The *Southern* Mongolians include the inhabitants of Tibet, China proper, Indo-China, Burma and the Himalayan slopes in India. The yellow-races occupy the greater part of Asia.

The Lapps and Finns of Northern Europe, the Magyars of Hungary, and the Bulgars and Turks of the Balkan peninsula are of Mongolian origin.

The Negro : A branch of the race, called *Negrito*, comprises various tribes. A few of these are found in the Malay Peninsula, the Andaman isles, and some parts of the East Indies. Their chief characteristics are short stature, dark-brown colour, and wavy or tufty black hair.

POPULATION

Look at Fig. 17 showing the distribution of population. Compare it with the Relief and Mean Annual Rainfall maps. You will at once see that where the surface is not mountainous and rainfall is sufficient population is dense. In Asia the density of population depends mainly on rainfall. About eleven-twelfths of the total population of the continent is concentrated in the monsoon area in which, on account of its high temperature and good rainfall, plant life flourishes amazingly. In Europe, the distribution of population depends not only on the relief and fertility of land, but also upon the distribution of

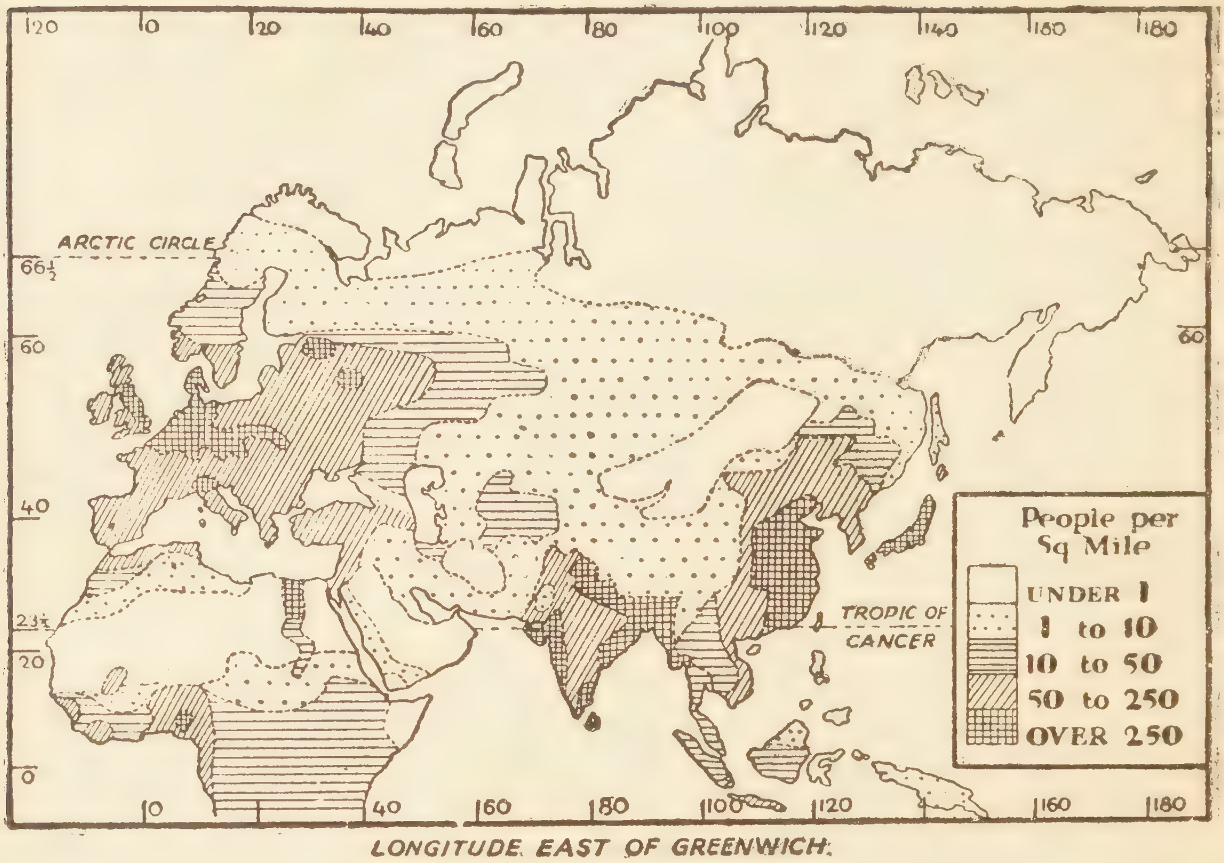


Fig. 17. EURASIA : Population.

mineral wealth, chiefly that of coal; hence the regions of dense population in Europe are the countries of Western and Central Europe which possess several coal-fields and the northern plains of Italy which are extremely fertile. Population is densest in the industrial centres of England, France, Belgium and Germany.

The cold deserts of the north and the dry deserts of the interior are sparsely populated. Some regions of south-west and Central Asia where rainfall is inadequate, have been rendered habitable by irrigation; and this accounts for the number of towns in Mesopotamia, Persia, Russian and Chinese Turkestan. In Siberia most people live along the Trans-Siberian Railway route.

The East Indies do not support a dense population, as they are not healthy.

The population of Asia is estimated to be 800 millions, of which more than 700 millions are in the monsoon lands. Europe has a population of 400 millions; half of them are in four countries—Britain, France, Germany and Italy.

EXERCISES

(1) What is the natural vegetation of Western Europe? Can you now meet with it anywhere there? Give reasons for your answer.

(2) What are Steppes? Where are they? Why are they found there?

(3) Which of the natural zones of vegetation are unfit for cultivation? Why?

(4) In what respects does a tropical forest differ from a temperate forest?

(5) Show by a diagram that vegetation belts vary according to latitude and altitude.

(6) Where are the following animals found; the reindeer, camel and yak? How are they fit to live in those regions?

(7) Name the people of Europe that belong to the yellow race What European nations are met with in Asia? Where are they found?

(8) Which has a greater population, the forest or steppe? Why?

(9) Which parts of Europe and Asia are densely peopled? Why?

(10) With reference to the natural regions of Eurasia, write down the corresponding regions in the other continents you have studied.

CHAPTER IV

THE BRITISH ISLES

POSITION AND SURROUNDING SEAS

The British Isles lie between latitudes 50° and 60° N., standing on the continental shelf just west of the mainland of Europe (Fig. 1). They form a group of some 5,000 islands having a total area of 121,000 square miles; but by far the greater part of the group is made up of the two large islands of Great Britain and Ireland.

The continental shelf is simply the submerged part of Western Europe. If it were raised 300 feet, Britain would once more become part of the continent, as it was long ago. The similarity of the rocks of Scotland and Norway, of the Fen District and Holland, of the chalk cliffs of Dover and Calais, and of Cornwall and Brittany shows the former land connection between the British Isles and the mainland. At the Straits of Dover Britain is within 21 miles of the continent.

The British seas are shallow. The North Sea in the east and the English Channel in the south are connected by the Straits of Dover. The shallowest part of the North Sea is the *Dogger Bank* where the water is only from 10 to 20 fathoms deep. This forms, like the Grand Bank of Newfoundland, an important fishing ground.

IMPORTANCE OF THE INSULAR POSITION OF THE BRITISH ISLES

(1) As the British Isles form an island group, the people have to take to the sea to get out of it. Englishmen

are therefore by nature sailors. The coast-line is so much broken that no place in the interior is far from the sea.

(2) Though '*insulated,*' the British Isles are not '*isolated*'; *i.e.*, they are sufficiently near the mainland of Europe to share in its progress and civilisation. The North Sea and the English channel are a strong line of defence, and have kept the islands free from invasion by a foreign foe.

(3) The position of the islands at the centre of the land hemisphere enables them to trade with Europe, Asia, Africa and America.

(4) Their island position gives them an equable climate.

(5) The warm shallow seas provide feeding and breeding grounds for fish, giving valuable food supplies. Moreover, they give occupation to thousands of fishermen, from whom the best sailors are drawn.

(6) Another important effect of the continental shelf is that the force of the tides is increased so that ships are carried farther up the rivers. The river estuaries are kept deeper and made more easy to enter by the scouring work of the tides.

RELIEF

Study figure 18 and refer to any good physical map of the British Isles. You will find three sets of highlands :—

(1) **The Northern Highlands of Scotland :** These include the *Northern Highlands* and the *Grampians* separated by the *Glenmore valley*. *Ben Nevis*, the highest peak in the British Isles, is only 4406 ft. high. The surface is very irregular on account of the action of ice and rivers. The lakes of this area are due to glacial action.

(2) **The Southern Uplands of Scotland :** *The Cheviot Hills, the Pennine Uplift* and *the Cumbrian*

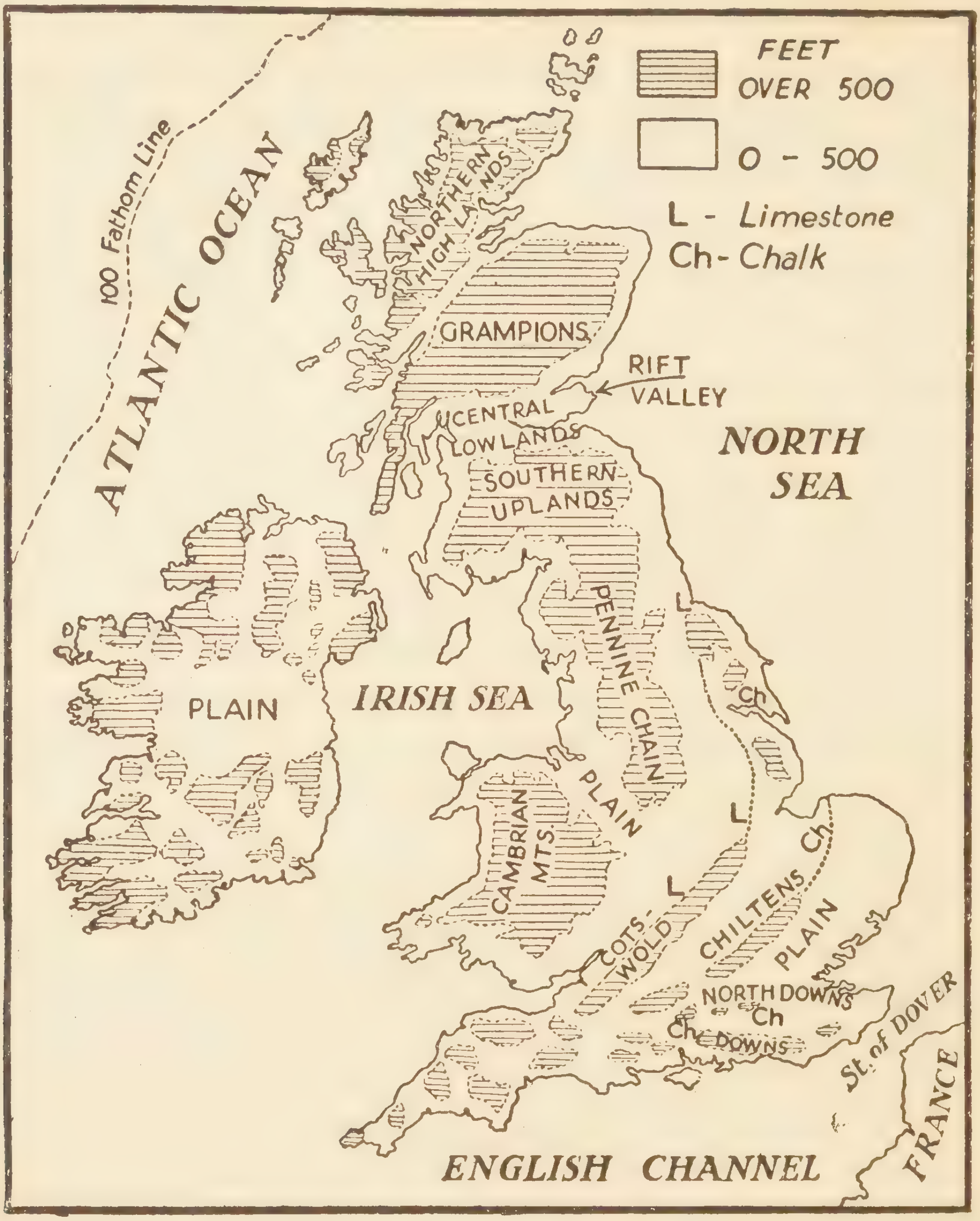


FIG. 18. THE BRITISH ISLES: Relief.

Mountains form one group. The last three form the northern highland system of England. The southern uplands nowhere reach 3,000 feet. The Cumbrian mountains are linked with the Pennine chain by *Shap Fell.*

(3) **The Western and South-Western Uplands of England:** This group consists of the *Welsh Highlands* or *Cumbrian mountains* and *the Cornish* and *Devonian Heights. Snowdon* in Wales rises to 3,571 feet.

The detached highlands of Northern Ireland are a continuation of the Southern Uplands of Scotland, and those of Southern Ireland are a continuation of the Welsh Highlands.

Similarly we find three lowland regions :—

(1) **The Central Lowlands of Scotland :** These are known as the Scottish Rift Valley on account of their origin. There are, however, ridges exceeding 2,000 feet in height. This valley lies between the Northern Highlands and the Southern Uplands of Scotland.

(2) **The Cheshire-Irish Plain :** This separates the central mass of highlands from the southern. The Cheshire plain lies between the Pennines and the Welsh Highlands.

(3) **The South-Eastern Lowlands of England :** The Chesire Irish plain is really a continuation of the English Plain which is again a continuation of the Great Plain of middle Europe.

The South-eastern Lowlands are crossed by two ridges, one made of (oolite) limestone and the other of chalk. These ridges have a steep, or scarp, slope on the western side, and a gentle or dip slope on the eastern side. The limestone ridge extends from the Cotswolds to the North Yorkshire Moors. The most important of the chalk ridges runs north-east from Salisbury Plain to York Wolds. The Chilterns and East Anglian Heights are parts of it. The North and South Downs are also chalk ridges. Between the North and South Downs lies the Weald Basin which was once covered with chalk.

The Bogs of Ireland : These form a special feature of the surface of the Central Plain of Ireland. This plain is composed of sheets of limestone which were once covered by coal measures, of which only very small portions remain now. This plain is dotted with a number of lakes most of which occupy hollows produced by the solution of limestone. In these shallow limestone lakes *bogs* are formed as a result of the growth and decay of a kind of moss and other marsh plants. The mass of decayed vegetation is called *peat*. This peat is cut into brick-shaped pieces, dried and extensively used as fuel in an almost coalless country like Ireland.

Rivers: Since the general slope of Great Britain is from west to east, the longest rivers flow to the North Sea, the *Severn* and the *Clyde* being the exceptions.

The *Shannon*, the longest British river, is in Ireland. In its course there are many lakes which are really expansions of the river. Its source is only 170 ft. above sea-level, so that its course is everywhere sluggish.

The *Thames* and the *Mersey* are of the greatest commercial importance. The *Clyde* is Scotland's most important river; it was deepened to accommodate ocean-going ships in 1768.

Some of the streams in the mountainous areas are noteworthy because their valleys provide routes for roads and railways, *e.g.*, the Tyne Gap and the Aire Gap in the Pennines, the valleys of the Forth and the Tay in the Scottish Highlands. Almost all the rivers have estuaries, and flow through busy industrial districts; thus connecting manufacturing areas with the sea-coast. They have important ports at their mouths: *e. g.*, London at the mouth of the Thames, Hull on the Humber, Liverpool on the Mersey and Glasgow on the Clyde.

CLIMATE

From what you have already studied about the climatic conditions of Western Europe, you will remember that the British Isles lie in the temperate belt and so have a cool equable climate. They lie in the belt of the Westerlies which bring warmth and moisture from the Atlantic. Pushed on by the Westerlies, the warm North Atlantic Drift (Gulf Stream Drift) brings warmth and moisture.

Look at the temperature map (Fig. 19). You see two isotherms: the 40° F. Jan. isotherm, and the 60° F. July isotherm. The January isotherm has a general north-south trend, and the July isotherm has a west-east trend.

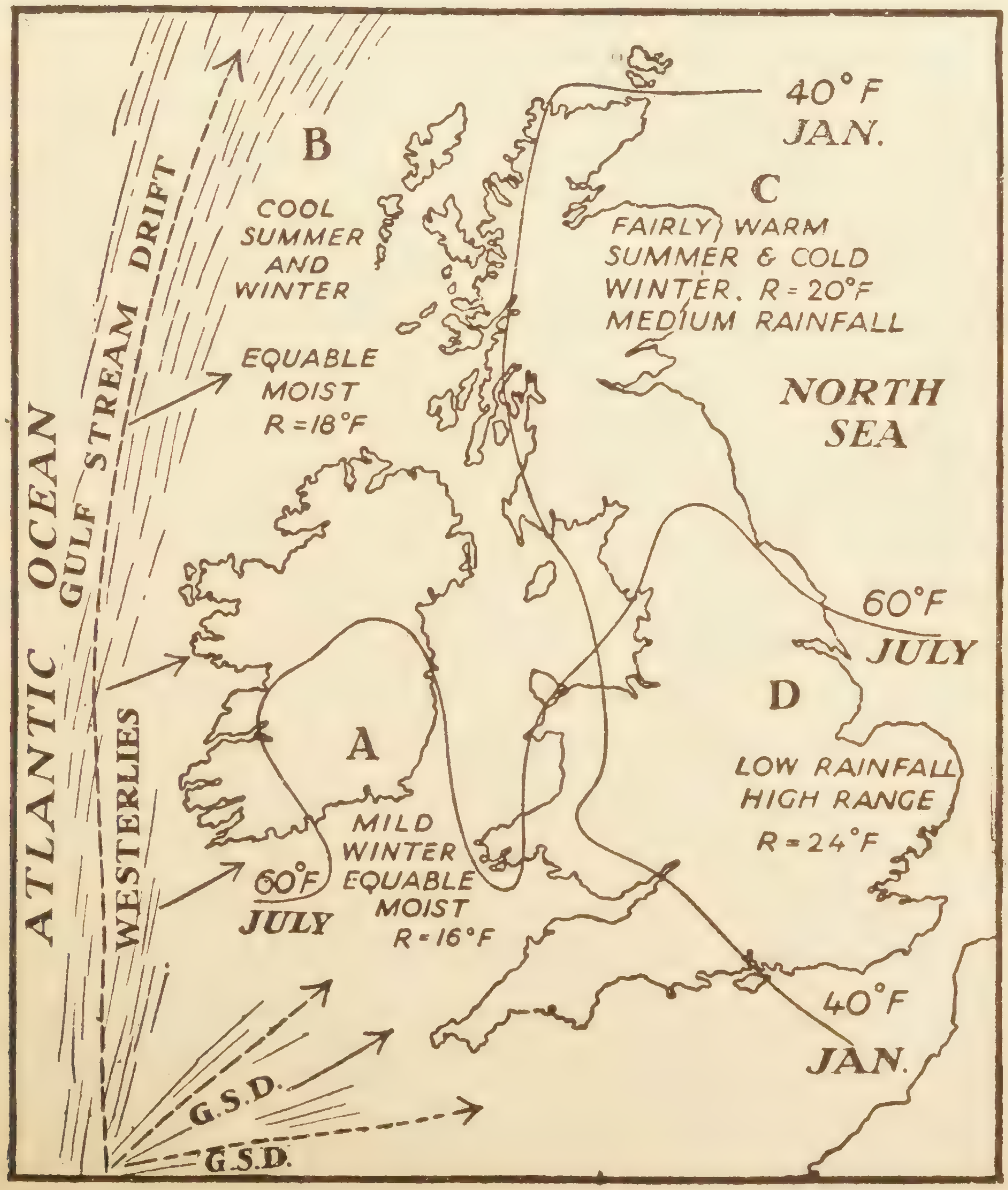


FIG. 19. THE BRITISH ISLES: Temperature and Climatic Belts.

In January the temperature decreases from 44° F. in the west to 38° F. in the east. The west is warmer than the east on account of the warm influence of the warm drift wafted by the prevailing westerlies. In July the temperature decreases from 62° F. in the south to 55° F. in the north. This is due to the influence of latitude. That part of the British Isles nearest the continent reflects continental conditions; and it is here that we find the greatest 'range,' *e. g.*, London: July, 64° F.; Jan., 38° F.; Range, 26° F. On the whole the British Isles have a cool summer and a mild winter.

Study figure 20 showing the Mean Annual Rainfall, and compare it with the relief map. The western side of the British Isles is much wetter than the eastern side; for the prevailing winds are the Westerlies, and as they are obstructed by the highlands in the west, their western slopes have heavier rain than the eastern slopes. The driest areas lie around the mouth of the Wash and the Thames. Note that the regions of greatest altitude have the heaviest rainfall. As the Westerlies are the prevailing winds at all seasons, rain falls throughout the year, but these winds are stronger and steadier in winter, and hence most rain falls at that season. Much of the rainfall of the British Isles is also due to the low pressure systems or cyclones that pass over them frequently from the Atlantic. On an average one of these cyclones reaches Britain every ten days. These cyclonic depressions bring dull, wet weather, and are most frequent in *winter*; while anti-cyclones which bring fine dry weather occur both in *winter* and *summer*. The British Isles are notorious for their *changeable* weather.

Fig. 19 also shows the four main climatic divisions of the British Isles. The south-western region has the least

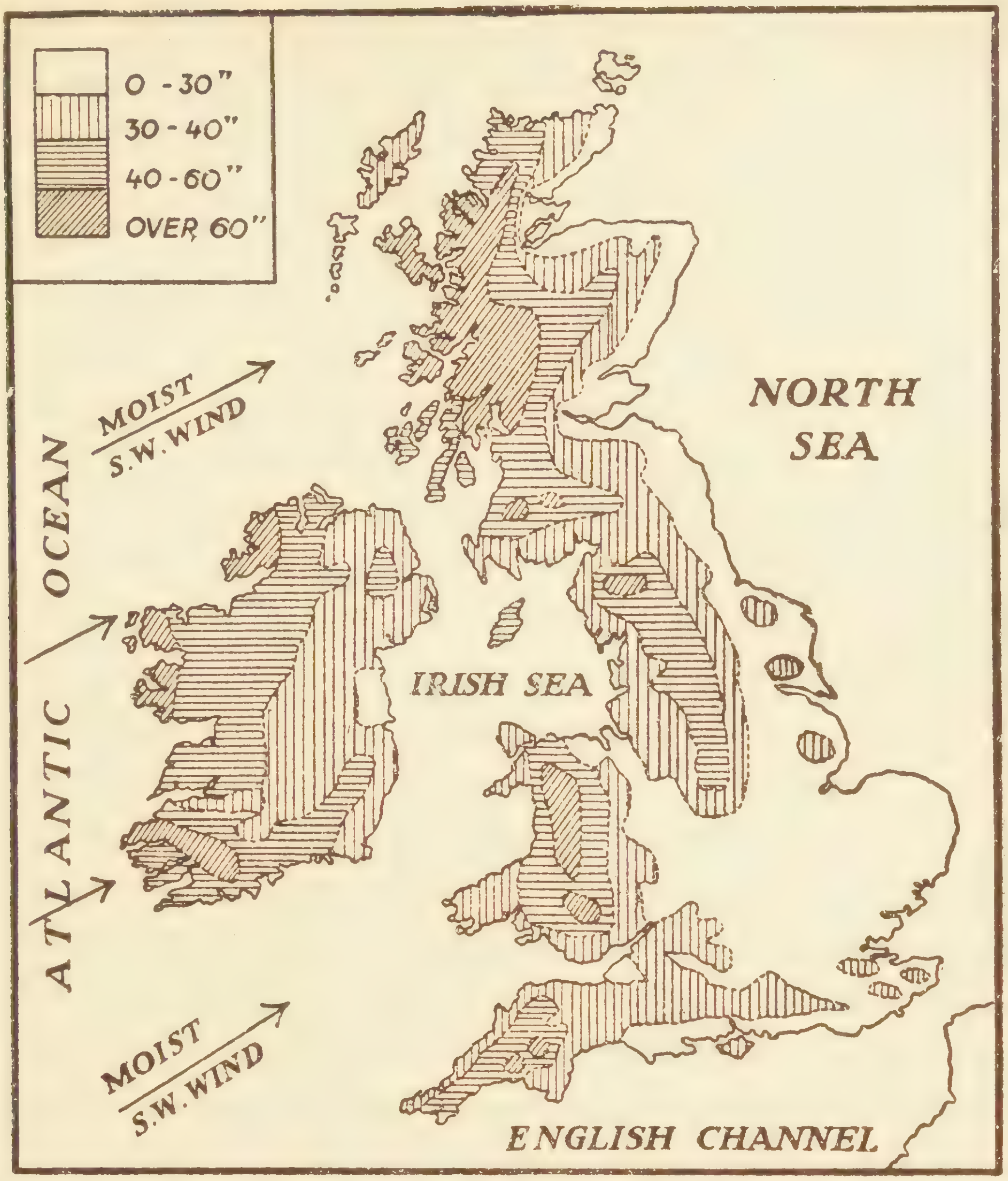


FIG. 20. BRITISH ISLES: Mean Annual Rain fall.

range, and therefore the most equable climate. The southeastern region has the greatest range, and is therefore least equable.

BRITAIN'S CLIMATIC ADVANTAGES

(1) *The climate is equable.* Neither summer heat nor winter cold is excessive. Such a climate enables the British people to maintain life easily and to work comfortably at all seasons. It is this ideal climate that has made them energetic and enterprising, and has enabled them to take

a high place among the nations of the world. Contrast Britain with India in this respect. The heat in our country is so excessive as to enervate man and hinder all industry.

(2) *Rainfall is so abundant* as to favour the cultivation of important food plants and the growth of rich pastures upon which fine breeds of sheep, cattle, horses and pigs can be reared.

Wheat is grown in the south-east of Britain where summers are longest, driest and sunniest. The chief wheat lands lie south-east of a line joining the mouths of the Tees and the Severn. *Barley* and *oats* can stand cold and wet better than wheat, and are therefore more widely spread.

Root-crops, like potatoes, flourish on the more moist arable lands. Potatoes have become one of the main food crops in Ireland. Roots provide valuable food for all kinds of farm animals, especially in winter.

The best pasture lands for *sheep* are on the hill slopes of the Southern Uplands, Wales and the oolite and chalk hills of south-east England. *Cattle* flourish best on the rich lowland pastures of Ireland, Cheshire and Devon.

Hence Britain is famous for the cheese of Cheshire, the butter of Ireland, and the cream of Devonshire. *Pigs* thrive upon the waste of dairy farms, and so they are reared largely in the cattle-rearing areas. *Horses* are largely reared in areas noted for the growing of oats.

(3) *The winter cold is never so severe as to block the harbours with ice.* The ports of Eastern Canada in the same latitude as Britain are ice-bound for four or five months. Why ?

The distribution of industries is governed by climatic conditions. The cotton industry of Britain is located in places where the climate is moist, because in a dry climate the fibres break easily and spinning is rendered difficult.

NATURAL VEGETATION

The climate of the British Isles is very favourable to the growth of trees. At one time very large areas were covered with forests, mainly of the deciduous type. Most of the land has long been cleared for agriculture, so that these forests exist only in samples to-day. Some coniferous trees are found in northern Scotland. *Fruit trees* such as the apple, pear, plum, cherry are grown especially in the sheltered valleys. The Severn Valley and Kent are important areas. The higher mountains of Scotland, England and Wales are clothed with *heather*. Such areas are called *moorlands*. These moorlands are found at elevations exceeding 600 feet, so that England has a smaller proportion of moorland than Scotland, Ireland or Wales.

MINERAL WEALTH

Minerals: There are vast deposits of *coal* and *iron* in Britain which form the basis of her manufacturing industries and the chief source of her wealth. Coal is found in the *coal measures* which are not all coal but consist of alternate beds of sandstone, clay and coal. Coal measures may be 2,000 to 5,000 feet thick, but the thickest *seam* in England is only about 30 feet. Below each coal seam is a deposit of clay which seems to have been the soil in which grew many of the trees and plants whose remains form the coal.

Figure 21 shows the distribution of the chief coalfields of Great Britain. Ireland has very little coal, and is mainly an agricultural country.

I. **The Scottish Coalfields:** (1) *Ayr* coalfield, (2) *Lanark* coalfield, (3) *Firth of Forth* coalfields (including those of Edinburgh and Fife). These fields are found in the midland valley.

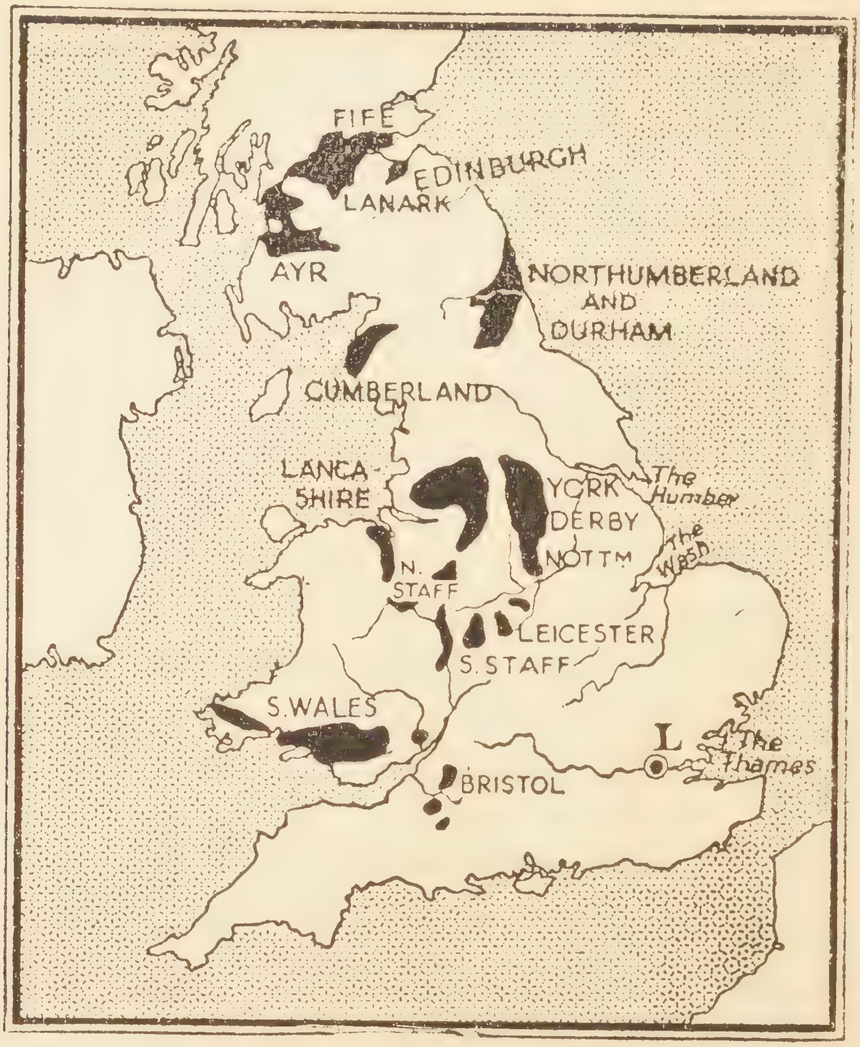


FIG. 21. BRITISH ISLES: Coalfields.

II. **Coalfields of England:** (1) *Northumberland and Durham* coalfield. (2) *York, Derby* and *Nottingham shire* coalfield. (3) *Cumberland* coalfield. (4) *South Lancashire* coalfield. (5) *The Midland fields*—North and South Shaffordshire, Warwickshire, Leicestershire and Shropshire fields. (6) *South Wales* coalfield. (7) *Bristol* coalfield. In almost all the fields iron occurs with the coal or near it, and this accounts for the swift progress of the iron industry in the country. Why? In almost every case, limestone too is close at hand. What is its use?

British coal is of excellent quality. The largest fields are on or near the coast so that export is easy. This also facilitates the import of raw materials and the export of manufactured goods. There is enough to supply Britain's own needs and to pay for raw materials with which to keep the factories at work. The chief countries to which British coal is exported are Italy, Denmark, Sweden, Norway, Holland, Argentina, Egypt, etc. Very little iron ore is exported, but high grade ores are imported from Spain and Sweden.

The development of the coal and iron resources of the country has led to marked changes in the distribution of the population. Before the development of the manufacturing industries, the population of Britain was densest in the south-east where the richest agricultural lands are to be found ; but now it is most densely concentrated in the manufacturing regions of the coal fields.

Besides coal and iron, Britain has valuable deposits of salt, copper, tin and lead. Salt gives rise to important chemical industries. Salt is found in rocks. Deep bores are made into the salt, and water is allowed to flow into them so that a subterranean lake of brine is formed. The brine is pumped up, and the salt is recovered by evaporation. Salt is mined in Cheshire, Lancashire, Staffordshire, Yorkshire and Durham.

INDUSTRIES AND PORTS

Figure 22 shows the chief industrial centres and ports of Britain. Note that the industrial centres are located on the coalfields. Steam is needed to drive the machinery used in factories, and it is obtained by heating water with coal. Before the steam engine was invented, water power was used, but now oil and electricity are threatening the supremacy of coal as a source of motive power.

The industrial development of a country depends upon the following factors : (1) raw materials or facility to

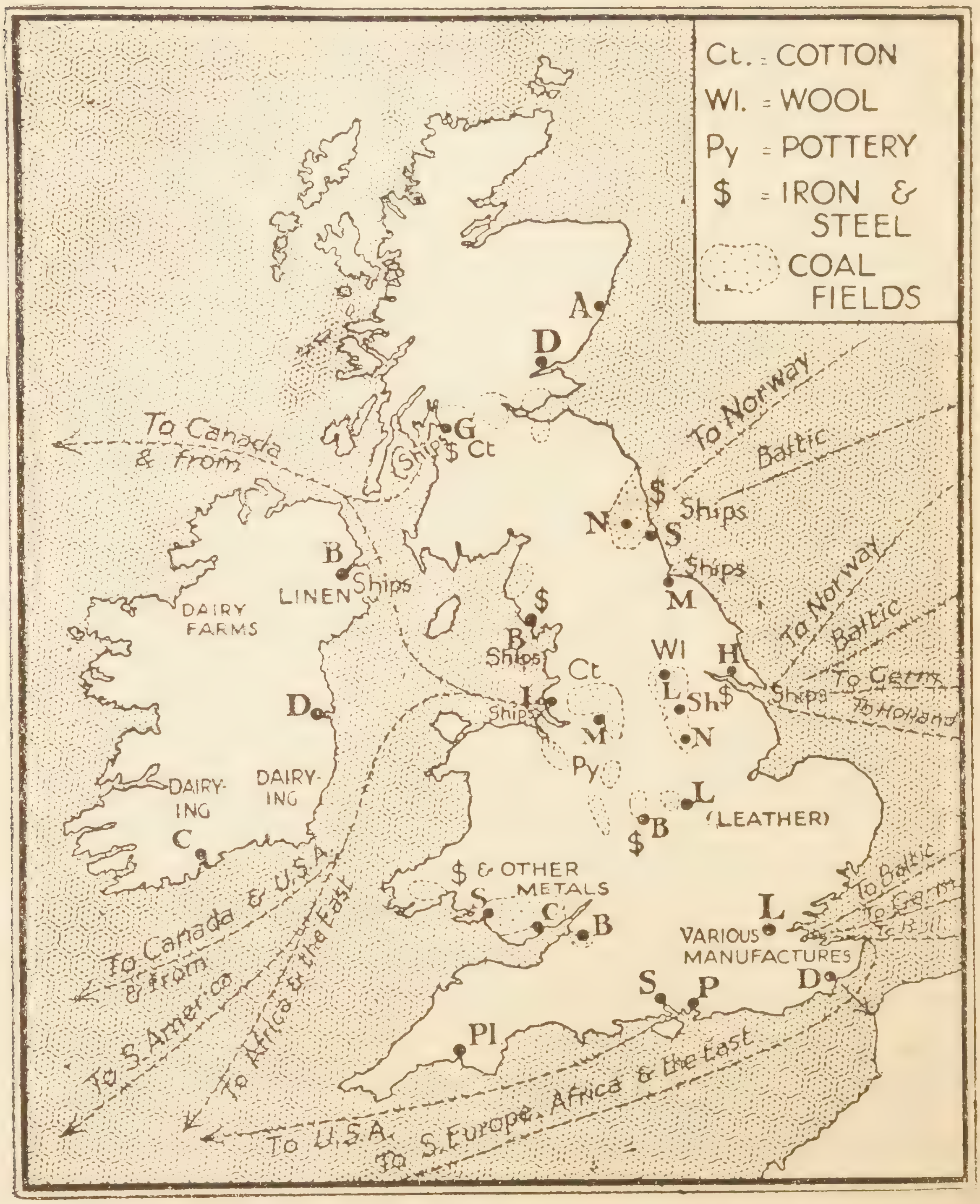


FIG. 22. THE BRITISH ISLES: Industries and Ports.
Note that the industrial centres are all situated on coalfields.

import them; (2) motive power—wind, water, steam (coal,) oil or electricity; (3) suitable climate; (4) markets to buy the manufactured products; (5) easy means of communication to send the manufactured products to the markets; (6) skill on the part of the people due to an *early start*.

Industrial development naturally leads to commercial development; for factories produce more articles than what the people of the cuontry require, and manufacturers are, therefore, forced to find buyers in other lands.

Northern England is the most important industrial region of Britain : four of the coalfields are situated there.

(1) **The Northumberland-Durham Coalfield:** *Engineering* is the most important industry here, and *New Castle* is the seat of some of the greatest engineering works in the world. *Ship-building* is the most important branch of engineering in this area ; for large quantities of iron and steel are available, and the export of coal makes ships necessary. *Sunderland* and *Hartlepool* are other ship-building towns. Steel plates, big guns and ships' engines and all industries connected with ship-building are also important.

The Cleveland district of Yorkshire is the greatest producer of *iron ore* in the British Isles. The ores obtained here as well as those imported from Scandinavia and Spain are smelted in the Middlesbrough district. The salt of Cleveland and the Tees valley had led to the chemical industry of Newcastle and South Shields.

(2) **York, Derby and Nottingham Coalfield:** The establishment of the *woollen industry* of Yorkshire has been determined by the following geographical conditions : (1) The raw material came at first from the sheep of the Pennines, but now much is imported from Australia, New Zealand, South Africa and South America, (2) At first there was water power, but now there are rich supplies of coal for power, and iron for machinery. (3) The pure soft waters of the rivers are suitable for dyeing. (4) The countries opposite this area have severe winters and hence the people there need warm clothing. (5) The

Humber estuary provides ports for receiving raw materials, though most wool comes through Liverpool and London, and exporting finished products. The centre of the industry is *Leeds.*

Hull on the Humber, is the third port of Britain, and occupies an excellent position for trading with continental North Sea and Baltic ports. It is one of the chief towns engaged in the Dogger Bank fisheries. It also ships to the continental ports the cotton goods of Lancashire.

Sheffield is the most important seat of the steel industry, making armour plates, big cutting tools and cutlery. It possesses a kind of rock which makes excellent grindstones.

(3) **The South Lancashire Coalfield :** The *cotton industry* of this area is due to (1) the facility for importing cotton from the United States through Liverpool ; (2) the existence of coal to supply power ; (3) the climate suitable for spinning fine yarn ; (4) the supply of salt from Cheshire, the basis of a chemical industry which provides bleaching powder ; (5) the manufacture of dye-stuffs from coal-tar products ; (6) supplies of good water provided by the rivers from the Pennines. The chief centre of the cotton industry is *Manchester.* Its importance has increased since the construction of the ship-canal (Fig. 23) in 1894, and it has become a seaport. This canal connects Manchester and Liverpool, and is 35½ miles long, 28 ft. deep and 172 ft. wide. Manchester is really a great warehouse to which the manufactured goods from the neighbouring towns are sent. Manchester also manufactures a great deal of the machinery and plant used in the various industries of South Lancashire.

Liverpool, the second port of Britain, is the great outlet and natural seaport of all the industries of Lancashire

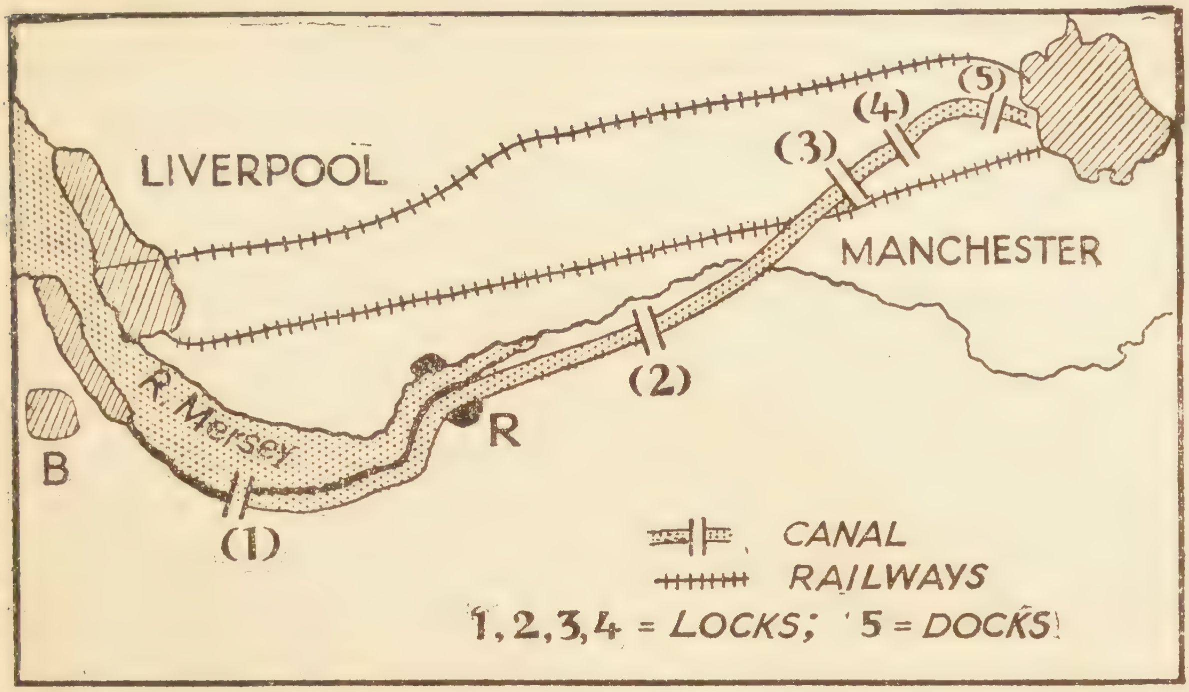


FIG. 23. Manchester Ship-canal.

and the Midlands. It also exports Yorkshire woollen goods to Ireland and North America. From Ireland Liverpool imports dairy produce; from the West Indies tobacco and sugar; from North America meat, wheat, timber and raw cotton; and from West African ports palm oil and kernels, rubber and ivory. On the opposite bank of the Mersey is *Birkenhead*, with great ship-building and engineering works. It is connected with Liverpool by a railway under the estuary.

Lancashire is finding it more and more difficult to keep ahead as competition from Germany, America and Japan is very keen.

(4) **The Cumberland Coalfield:** Some of the coal is used in the smelting of iron ore, but most of it is exported to *Belfast* in Ireland, and *Barrow* in the Furness district of North Lancashire. The Furness district is rich in iron ore of excellent grade. Barrow's chief industries are shipbuilding and the manufacture of armaments.

(5) **The Midland Fields:** North Staffordshire has clay suitable for the manufacture of pottery. Hence the pottery industry was started; but for the finest China and porcelain, kaolin (or China clay) is imported from Cornwall and Devonshire. Good supplies of coal and the skill of the workers have kept the industry in the district. *Stoke* and *Burslem* are two of the chief centres of this industry. This coalfield is commonly called *the Potteries*.

The South Staffordshire coalfield is known as the *Black Country.* All the towns are engaged in iron and hardware manufactures. As the coalfield is in the interior of the country, most of the articles manufactured are of little bulk as compared with their value. The great centre of the Black Country is *Birmingham,* which is engaged in the manufacture of a variety of articles. It is particularly noted for fire-arms, engines, motor cars and cycles, scientific instruments, etc. The city is not on the coalfield itself, but has excellent canal and railway connections. At first its iron-smelting was carried on with the help of charcoal obtained from the surrounding forest.

Coventry on the Warwickshire coalfield is famous for its motor cars and cycles.

The English Midlands are also a valuable farming and cattle-rearing region. The chief industry is dairy-farming. *Stafford,* midway between the Potteries and the Black Country, is famous for its boot and shoe factories.

(6) **The South Wales Coalfield:** Steam coal is got from the centre of the field, and all along its northern edge are iron deposits. Now great quantities of iron are imported from Spain. *Merthyr Tydvil* round which lie the richest iron deposits, *Swansea* and *Cardiff* are the chief smelting centres. Tin and copper are smelted at Swansea which is opposite Cornwall and Devon which at

first supplied the two minerals. Now *copper* comes chiefly from *Spain*, and *tin* from *Malay*. The tin-plate industry is centred in *Cardiff*. This coalfield is also the most important centre of the steel industry in the British Isles.

So far as coal output is concerned, York, Derby and Nottingham coalfield ranks first, next comes the Northumberland and Durham, and third the South Wales coalfield.

(7) **Bristol Coalfield:** *Bristol* owed its origin as a port to its trade with Ireland. After the discovery of the New World its trade was extended to the West Indies and the two Americas.

Its sugar, cocoa, and tobacco industries are based on this trade with the New World. The neighbouring coalfield supplies fuel and power. Besides sugar, tobacco and cocoa, leather, oil, timber and paper pulp are imported from the Americas. Bristol's outport is *Avonmouth*, the modern harbour for large ocean-going vessels.

(8) **London,** on the Thames, is also a great manufacturing city: almost every industry in Britain finds a home there, not because of local resources of coal and raw materials, but because the city is accessible by land and sea, and coal and raw materials can be easily brought there. Again the city has in its own vast population a ready market. Leather and soap-making, paper-making (encouraged by the enormous amount of printing) and manufacture of motor cars are some of the important industries.

London, the capital of the United Kingdom (England and Wales, Scotland and Northern Ireland) is the chief city of the World. Its importance is due to its geographical position. It is the bridge port of the Thames, and is the most important railway centre in the country (Fig. 24). It faces the richest and busiest countries of the European Continent. The tidal flow of the Thames admits large vessels. The docks and ware-houses have kept pace with the growing trade. London has a good position as a distributing centre. The imports of London include wheat and meat from U. S. A. and Argentina ; tea from China, India and Ceylon ; dairy produce from Denmark and Holland ; mutton and wool from Australia and New Zealand ; silk from China and Japan ; ivory and rubber from the Congo, etc.

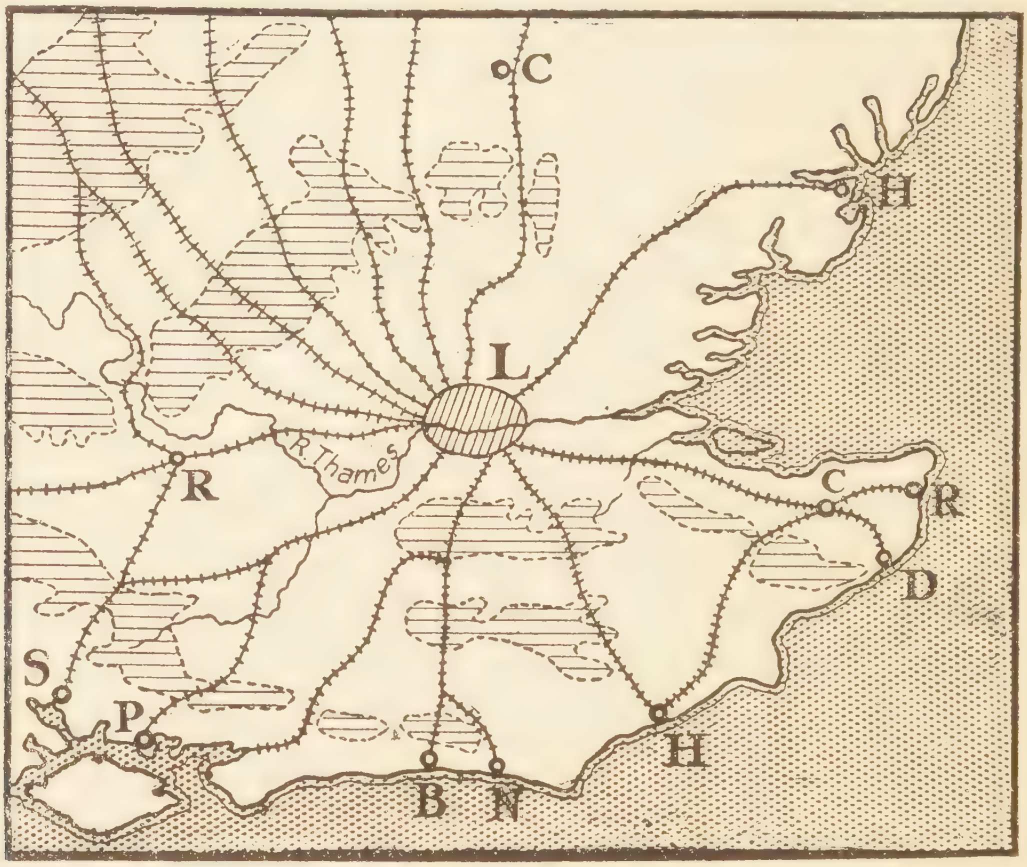


FIG. 24. Position of London.

The hundreds of thousands of people who work in the city live in the suburbs. To cope with the passenger traffic under-ground electric railways have been built. Greater London has a population of 75 lakhs.

South-east England is mainly an agricultural and pastoral region. Towns like *Lincoln*, *Norwich*, *Ipswich* and *Bedford* manufacture *agricultural implements*. *Northampton* is noted for its *boots* and *shoes*, Bedford for its *straw-plait* industry, and *Reading* for its *biscuits*.

(9) **The Central Lowlands of Scotland** are the most important part of Scotland. Four-fifths of the people of Scotland live here, and most of them in the lower Clyde valley. The Southern lowland belt includes the great industrial regions of Scotland. Iron is found with coal, and limestone is found in plenty in Edinburgh and Fife. Hence *iron-smelting* is an important industry. Much ore is also imported from Spain and Scandinavia. *Steel goods* are made at *Glasgow*. *Shipbuilding* is an important industry along the lower Clyde. *Paisley* has important *cotton thread* manufactures. Sugar from America and the West Indies, refined in Glasgow, and fruit from the Clyde valley, give rise to *jam-making*. The canal connecting the Firths of Clyde and Forth, gives Glasgow a water outlet to the North Sea, but it is very small and can only be used by small boats. Glasgow exports ships, machinery, iron and steel manufactures, cotton and linen goods ; and imports wheat flour, meat, timber, iron ore and cotton.

The *Ayr Coalfield* exports large quantities of coal to Belfast and other Irish towns. The Eastern coalfield exports much of its coal to Norway and the Baltic countries. *Dundee*, with *jute* from Calcutta, makes sacking and mats, and is the chief whaling port of the British Isles. *Edinburgh* has printing and paper-making industries, distilleries and breweries. It is more important for its colleges than for its manufactures. *Leith*, its port, and now part of the city, imports esparto grass and wood pulp for paper-making.

Tweeds are manufactured in the towns on the banks of the Tweed, the wool being supplied by the sheep farms on the Southern Uplands.

(10) **Ireland** is at present not an industrial country, for it has very little coal. The hydro-electric power scheme, now being carried out on the *Shannon*, may lead to the development of Irish industries. The only town that has several large industries is *Belfast* in north-eastern Ireland. *Shipbuilding* and the manufacture of *linen* are the most important industries. Much flax is grown in the district near Belfast. Coal and steel plates for shipbuilding are imported from the Clyde Basin and the Cumberland coalfield.

Ireland is largely a farming country ; cattle and pigs are reared in large numbers. Dairy farming is important, and butter and condensed milk are exported.

COMMUNICATION AND TRADE

The various parts of Britain are now bound together by roads, railways, canals and air routes.

Railways : There are four great *railway systems* : (1) London, Midland and Scottish Railway ; (2) London and North-Eastern Railway ; (3) Great Western Railway ; (4) Southern Railway.

The London Midland and Scottish (L. M. S.) has two main lines ; one running from London to Leeds, and thence passing through the Aire Gap to Carlisle, and the other passing through the Black Country, the Potteries and Lancashire to Carlisle. The two lines connect Carlisle and Glasgow whence the route continues to the extreme north of Scotland.

The London and North-Eastern (L. N. E.) runs from London to north-eastern England and thence through the east of Scotland to Edinburgh and towns further north.

The *Great Western* sends out three branches, one to Chester, another through Bristol to South Wales and the third to the south-western end.

The *Southern Railway* has lines to every place of importance on the south coast, *e. g.*, Dover, Folkestone, Newhaven and Southampton. From these ports steamboats run regularly to ports in France and Belgium : Dover to Ostend (68 miles) ; Dover to Cailais (21 miles) ; Folkestone to Boulogne (26 miles) ; Newhaven to Dieppe (67 miles) ; Southampton to Havre (112 miles).

Canals : All the rivers of the midlande are linked by canals, so that Birmingham is connected with the four great estuaries and their ports, Hull, Liverpool, Gloucester and London. The *Liverpool-Leeds Canal* passes through the Aire gap. The *Manchester Ship Canal* has already been mentioned. Many of the English canals have fallen out of use owing to the competition of the railways. If brought up to date, they can be made to serve as a cheap and reliable means of communication.

Sea-ways : Britain's insular position in the midst of the land hemisphere enables her to be in touch with the whole world. The great seaways join her to the rest of the world : the four great routes being Suez, Cape of Good Hope, Cape Horn and Panama routes. These sea-ways form the great link of the British Empire.

Trade : British exports are chiefly manufactured goods, *e. g.*, *Cotton-goods* to India and China ; *railway engines* and carriages to India and Argentina ; *woollen goods* to Australia, Canada, Germany and France ; *iron and steel goods* to India and Australia, *linen goods* to U. S. A., Australia and Canada. Coal is also exported.

In return for these exports, food and raw materials form the principal imports, *e. g.*, *Wheat* from U. S. A., Canada and Argentina ; *beef* and *mutton* from Argentina, Australia and Uruguay ; *butter* from Denmark, Russia, Sweden and France ; *sugar* from Germany and Holland ; *tea* from India, Ceylon and China ; *tobacco* from U. S. A., and Cuba ; *raw cotton* from U. S. A., Egypt and Br. E. Indies ; *wool* from Australia, New Zealand, South Africa and Argentina ; *timber* from Russia, Sweden, Canada and U. S. A. ; *rubber* from Brazil and Straits Settlements and Malay States ; *hides* and *skins* from South Africa, Australia, New Zealand and Argentina ; *copper ore* and *nitrates* from Chile, etc.

Cables, wireless, and air-routes are other links connecting Britain with the rest of the world. The accelerated air mail service of the Imperial Airways brings India within five days' reach of England.

EXERCISES

(1) State the importance of the insular position of the British Isles.

(2) Mention the three physical divisions of Scotland, stating the distinguishing feature of each region.

(3) Why are the south-eastern lowlands of England known as the scarp-lands ?

(4) How are bogs formed ? Can they be reclaimed ?

(5) What evidences are there to show the former connection of the British Isles with the mainland of Europe ?

(6) Why does the rainfall of England and Wales decrease from west to east ? Draw a diagram to show this with the help of the following figures :—
Mean annual rainfall in inches. Carmarthan, 49 ; Swansea, 42 ; Oxford, 25 ; Reading, 24·5 ; Greenwich, 23 ; Shoeburyness, 19.

(7) The mean number of rainy days in England and Wales is:

J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
17	14	15	13	13	12	14	15	14	17	18	18

Represent this by a diagram. Contrast with your own place.

(8) Draw diagrams to show the mean monthly rainfall in inches of:—

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Glasgow	4·8	3·8	2·6	2·4	2·2	3·1	3·5	4·0	4·3	4·3	3·6	4·5
London	2·5	1·8	1·6	1·9	1·9	2·5	2·4	2·4	2·7	2·7	2·1	2·1

Find the yearly mean and account for the difference in the total of the two towns.

(9) What effect has the climate of Britain on the character of the British people?

(10) What causes have made Britain a great industrial country?

(11) How does the distribution of coal and iron affect the distribution of population in Britain?

(12) What industries are carried on in (i) Manchester; (ii) Leeds; (iii) Belfast; (iv) New castle; (v) Sheffield; (vi) Glasgow? State the several causes that have brought about the location of their respective industries.

(13) Why is London a great manufacturing city even though it is not on a coalfield?

(14) Why is Ireland not an industrial country? What possibilities are there for her future development?

(15) Make out a list of the chief articles of food and drink and raw materials imported by Britain. State the country or countries from which each is imported.

CHAPTER V

THE WESTERN MAINLAND OF EUROPE

This includes the republics of *France* and *Germany* and the kingdoms of *Belgium*, *Holland* and *Denmark*.

FRANCE

France is twice as big as the British Isles, but its population is only about 41 millians which is less than that of Britain which has about 46 millions.

France has access to the sea on three sides; on the north to the English Channel, on the west to the Atlantic and on the south to the Mediterranean. There are two highland masses, the Central Plateau and the Alps. Between the Central Plateau and the Pyrenees lies the *Carcassone* gate, which forms the route between Western and Mediterranean France. The Central Plateau is separated from the Alps by the long and narrow Rhone-Saone valley which forms the chief route between the Mediterranean region and the Paris Basin. At its northern end the Central Plateau is connected with the Vosges and the Ardennes plateau by its lower north-eastern extension, the Langres plateau.

The coastal belt of the south-western plains consists of the sandy *Landes* whose sand-dunes have been checked from advancing inland by means of the planting of pine trees and grasses.

The climate of the lowlands to the west, north-west and north of the Central Plateau is of the *Western European type* (*Vide* Natural Regions of Europe); that of the

Central Highlands, of the *Central European type*; and that of the lower Rhone basin, the shores of the Gulf of Lyons and the Rivers is of the *Mediterranean type*,

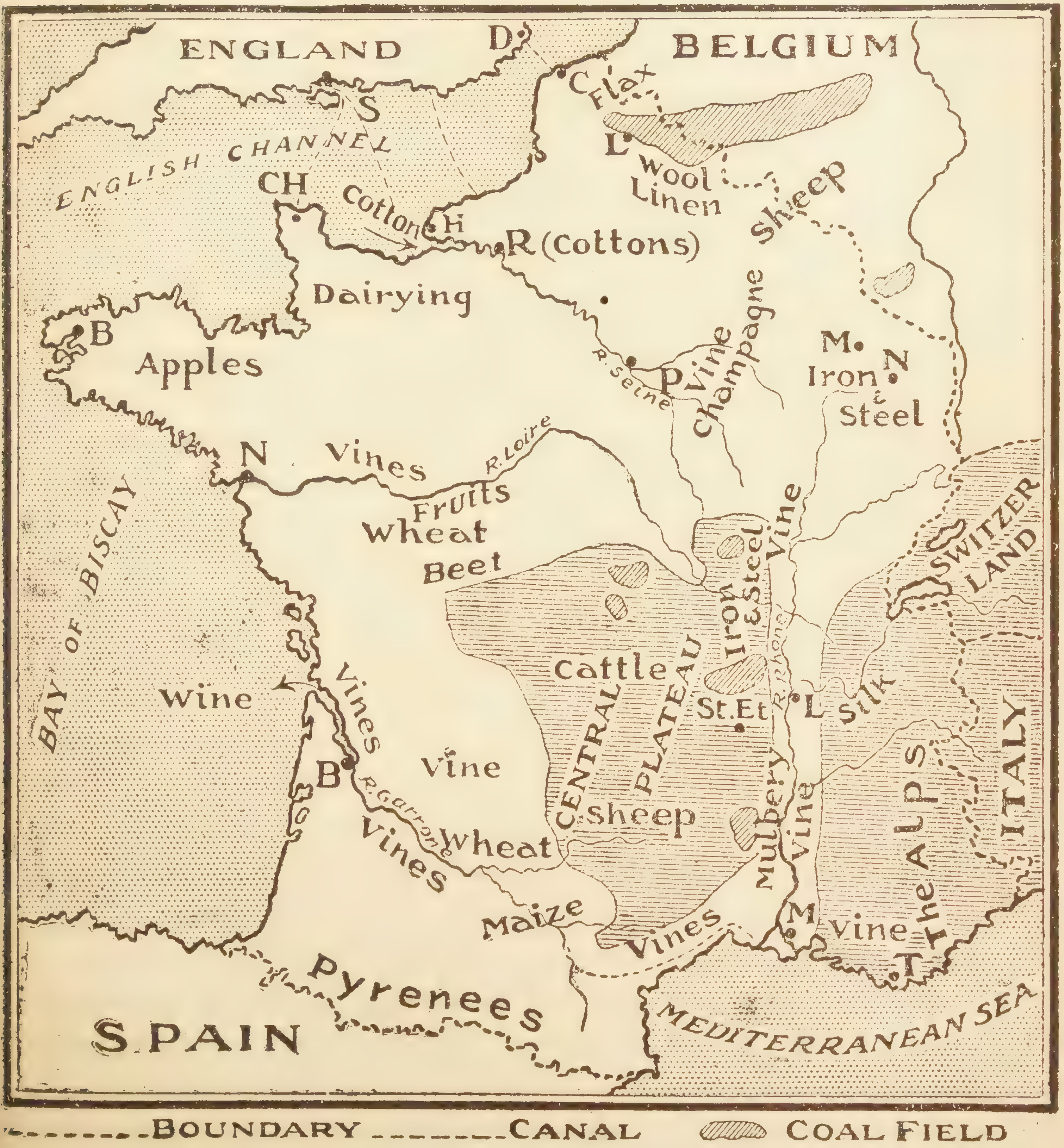


FIG. 25. FRANCE: Economic.

Agriculture is the most important French industry; nearly one-half of the total area of the country is cultivated. Most of the farmers and gardeners own the land they cultivate. *Wheat* is the chief crop, and it is extensively grown in the western and northern lowlands. The plains of the Paris basin and the middle and lower Loire basin form one of the richest regions in France. The middle Loire basin is called the "Granary of France." *Oats* are grown in the same districts as wheat. *Beet, flax* and *hemp* are grown on the plains bordering Belgium. In the rest of France *vine* is the chief crop. In point of value it comes second to wheat. The chief vine-growing and wine-making areas are: (1) the basins of the Garonne and the Dordogne where the *claret* wines are produced with Bordeaux as centre; (2) the valleys of the Loire and of the Upper Seine where the famous *champagne* is produced; and (3) the basin of the Saone. The best wines are made in the Lower Rhone Valley and the Mediterranean region.

In the region last named *olives* and *mulberries* are also extensively grown, and have led to the manufacture of *soap* and *silk* at such centres as *Marseilles* and *Lyons.* The olive oil takes the place of butter in the diet of the Mediterranean peoples. The orange, lemon and almond are important fruit trees grown in this region.

Brittany and Normandy have *market-gardens*, noted for early vegetables and *orchards*, for fruits, chiefly apples.

Nearly one-third of France is pastureland. The scarplands of the Paris basin support numerous *sheep. Cattle* are reared on the poor grass-lands of the Central plateau region and on the richer pastures of the north and west. In the latter region *dairy-farming* is an important industry. Fruit, flowers, vegetables and dairy produce are sent to England through the channel ports.

Mining and Manufacturing: The chief coalfields of France are: (1) the north-eastern or Franco-Belgian Coalfield;

(2) the Central Plateau coalfields of St. Etienne and La Creusot; and (3) the Saar coalfield. The north-eastern coalfield is the most important industrial area. Flax from Belgium and wool from the sheep farms of the Upper Seine support the *linen* and *woollen* industries of *Lille*. But much flax is imported from the Baltic countries, and wool from Argentina. *Lille* is also engaged in iron industry, and hence it is described as the "Birmingham" of France. Many other towns on the north-eastern coalfield are also engaged in textile works; *e. g.*, *Valenciennes* for lace, *Amiens* (cotton), *Cambrai* (linen), and *Rheims* (woollen).

Rouen, the centre of an important cotton manufacturing district, is far away from the coalfields. It has the advantage of an *early start*, for it was through Rouen that cotton was first imported from U. S. A. Cotton is also manufactured on each side of the Vosges mountains with the help of water-power.

The *Saar coalfield* was transferred to France for 15 years by the treaty of Versailles. The *St. Etienne* coalfield has both coal and iron. Hence St. Etienne is an important engineering centre. The silk industry is chiefly centred at *Lyons* at the confluence of the Rhone and the Saone. In addition to the local supply, silk is imported from Italy, China and Japan. Silk from the latter countries is imported through Marseilles.

At *La Creusot* where both coal and iron are found, steel rails and locomotives for the state railways and war materials are manufactured.

By the restoration of Alsace and Lorraine which had been taken from her by Germany, France has regained the iron and steel working near *Metz* in the Moselle valley. South of this, *Nancy* also has an iron and steel industry. The manufactures of France have not been able to become as great as those of Britain or Germany on account of the far smaller coal resources.

Towns: *Paris*, the capital of France, is a good example of a *focus town* where several routes converge (Fig. 26): *e.g.* the routes from the Channel ports; from the great European plain (Moscow to Paris line); from the Rhone valley *via* Dijon; from Switzerland and Southern Germany *via* the Burgundian Gate; from Spain through the Western lowlands. Thus Paris has connection with all parts of France and with most of the European capitals. It stands on a navigable river at the heart of rich agricultural lands.

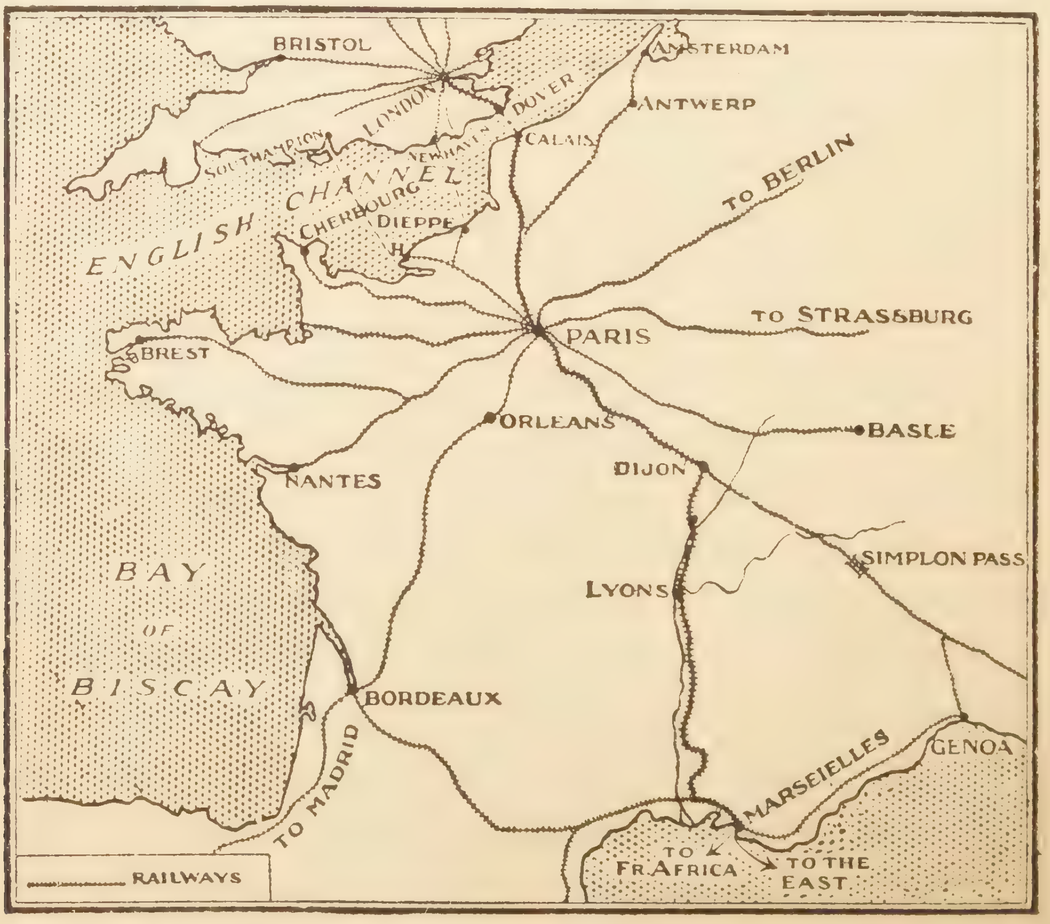


FIG. 26. Position of Paris and Marseilles.

As regards its industries it lies, like London, away from coal and iron. It is famous for articles of fashion and art.

The chief port of France is *Marseilles*, which lies east of the Rhone delta. It commands the route along the Rhone valley to Dijon, and beyond to the Paris basin and the channel ports (Fig. 26). The mails from London to India are brought by this route to Marseilles which is a great packet-station for the routes to the East. Its chief industries, wine, silk and oil are due to the vine, mulberry and olive that are grown in the Mediterranean region. It imports wine from Algiers, silk frem China and Japan, oil-seeds, palm-oil and copra from Africa and the East Indies.

BELGIUM (Fig. 28)

Belgium is one of the smallest countries of Europe. It is about 11,000 square miles in area, and has nearly 8 million people; it is therefore the most densely populated part of Europe. Belgium falls naturally into three regions: (1) the plain of Flanders; (2) the Ardennes plateau; (3) the Sombre-Meuse valley which separates the first two.

The plain of Flanders is a rich agricultural region growing oats and rye, potatoes, sugar-beet and flax. The Ardennes plateau provides pasture grounds for sheep; but in the valleys and on the hill slopes food crops are grown.

The manufacturing industry of Belgium is based on the coal obtained from the long narrow coalfield extending from the French frontier near *Mons*, through *Charleroi* and *Namur* to *Liege* in the Sombre-Meuse valley. Iron is also found in the eastern part of the coalfield; and it is also brought from Luxemburg and Lorraine; hence all the four towns mentioned above have *steel* and *engineering* industries.

At one time wool from England was exported to

Belgium to be made into cloth by the skilful Flemish weavers of Bruges and Ghent, but this industry has now declined.

Verviers, east of Liege, has *woollen* industry, the raw material being supplied from the Ardennes sheep farms. Flax grown in the country supplies raw material to the *linen* mills of *Ghent.* This town has also *cotton* factories, using raw material imported from America.

Both agriculture and manufacture in Belgium have been greatly aided by the very complete system of canals connecting the rivers and the close network of railways. There are 1,250 miles of navigable waterways, and 7,000 miles of railway.

Brussels, the capital of Belgium, is the focus of the railway communications of the country. *Antwerp,* the chief port of Belgium, stands on the tidal estuary of the Scheldt which is connected by canals to the Meuse and the Rhine. Its importance is partly due to the fact that it is a convenient port for the industrial regions of Germany. It has an important ship-building industry.

HOLLAND

Holland is about 12,600 square miles, less than half the size of Scotland. It has a population of nearly seven millions, and the density of population is nearly equal to that of England and Wales. Much of the land is below sea-level, and hence the country is known as the *Netherlands.* The western part of the country is largely made up of the Rhine delta. Practically the whole of this region was liable to flooding by rivers and the sea and therefore had to be protected by *dykes* or embankments where there were no sand dunes. The water in the enclosed areas (called *polders*) was pumped out into canals constructed on the top of the dykes; this water was pumped to higher dykes till it was taken to the rivers or the sea. Windmills were employed for pumping, but their place is now being taken by steam pumps or pumps worked by electricity generated by steam engines. Roads and railways, too, run on the top of the dykes. A constant watch has to be kept upon the sea dykes as well as those bordering the rivers. There is now a scheme to reclaim four *polders* from the Zuider Zee (South Sea) in the north by building a dyke across its narrow part.

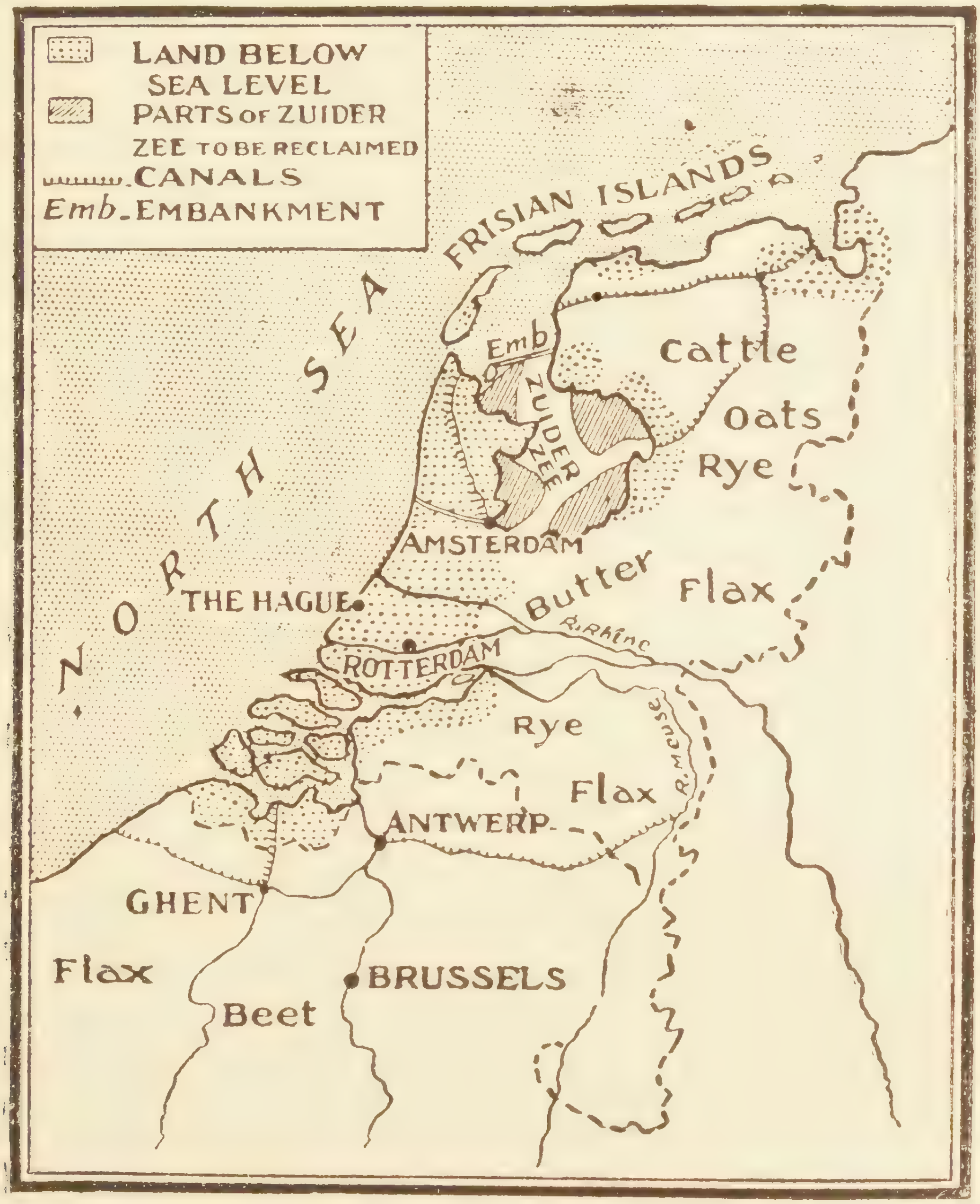


FIG. 27. HOLLAND: Economic.

It is expected that a quarter of a million people will find support on the new lands. Much of the low-lying land of Holland has been reclaimed from the sea by the work of man. The long fight against the encroachments of the sea and the difficult task of reclamation have made the Dutchmen of the polders sturdy and persevering.

Since the land is composed of river silt, there are no minerals except in the south-east; Holland is therefore essentially *agricultural* and *pastoral*. In the sandy strip of country behind the dunes fruits and flowers are largely grown. Near the *Hague* fruits (grapes and peaches) are grown in glass houses and exported to America.

In the region below sea-level which is too damp for cultivation, *cattle-rearing* is very important. Butter and cheese obtained from the dairy cattle are exported to London and to the German manufacturing centres. The dairy industry is largely controlled on the co-operative plan as in Denmark, most of the dairies being owned by co-operative societies. In lands above sea-level and below river-level sugar-beet, potatoes, flax, beans and onions are cultivated. In eastern Holland sheep are more important than cattle; and rye, oats, beet and potatoes are grown. From potatoes starch is obtained; from the stalks of rye and oats, strawboard is made; from beet sugar is refined. The corn crops in the country are not sufficient for the needs of the dense population, and wheat and maize are imported.

The situation of Holland at the mouth of the Rhine gave the country great opportunity for trade, so that 300 years ago the Dutch had nearly all the *carrying trade* of the world in their hands. They acquired many colonies, but most of them have been lost, and the Dutch East Indies are the most important of those that remain. A large proportion of the people of Holland get their living by trade. The fishing industry of Holland was the training ground for those sailors who laid the foundation of Dutch colonial power and foreign trade.

The manufacturing industries of Holland which arose in earlier times when coal and iron were not necessary, still continue even though these minerals are lacking. A very small amount of coal is found in the extreme south. Coal and iron and steel-goods are imported, but some textiles are manufactured, namely cotton, woollen and linen goods. The cotton industry is chiefly carried on at *Utrecht*. At *Delft* near the Hague, pottery has developed. From the Dutch East Indies cinchona, cocoa, tobacco and cane-sugar are imported ; and based upon these products, quinine, chocolate, tobacco, sugar and distilling industries have sprung up. The precious stones brought from the east to Amsterdam have made the city the chief European centre of the diamond-cutting industry. Thus most of the industries of Holland are due to " early start."

The Hague, the political capital and residence of the Queen, is often the meeting place of international conferences. *Rotterdam*, the chief Dutch port, is reached by large steamers by a canal. *Amsterdam* the largest city (over 600,000 inhabitants) in Holland stands on the shallow Zuider Zee, and so has a less favourable position than Rotterdam. It is reached from the North Sea by two Canals : the north Holland Canal (now out of use) and North Sea canal (a much deeper and broader one) connecting the city with Ijmuiden. Amsterdam is also joined by Canal to Rotterdam and the Rhine. As the Rhine is the best and most direct outlet for the Ruhr-valley industrial region of Germany, Holland enjoys enormous transit trade.

DENMARK

(Refer to figure 29 'The Baltic States'). This is quite a small country with a population of about three million people. It consists of the northern part of the peninsula of Jutland and the islands between that peninsula and southern Sweden. The largest island is Zealand on which stands the capital, *Copenhagen*. Between the islands and the mainland are three entrances to the Baltic sea, the Sound, the Great Belt and the Little Belt.

The Danes have always been a sea-faring people; many of them still make their living either as fishermen or sailors. Denmark has no coalfield and therefore has no manufactures of importance. It is now a country of *dairy farms*.

Dairy-farming: During the last forty years enormous progress has been made. The number of cattle has greatly increased and with it the production of butter, cheese and cream. The quality of the animals has been improved, and there is a marked increase in the milk yield per dairy cow. Most of the work in the dairies is done by machines, and modern science has been applied to the methods of production. The number of animals is so great that they cannot be fed on the pastures and crops of Denmark; so large quantities of cattle food (barley, maize and oil-cake) are imported. Feeding-cake for cattle is manufactured from *soya beans* imported from China and Japan. A large proportion of the dairy products is exported to the neighbouring countries, especially Britain and Germany, in exchange for the food and clothing required for the people. Another industry connected with dairy-farming is the *rearing of pigs*. These are fed on the skimmed milk returned from the creamery. Hence Denmark has a large export trade in *bacon* and *ham*. Large numbers of *poultry* are kept on the farms, and enormous quantities of eggs are also exported.

One great feature of this industry is the development of *co-operation*. The farmers in a district join together and establish a large dairy; their milk is taken to this dairy, and all of them share in the profits of the manufacture and sale of the products. Similarly there are co-operative societies for collecting and exporting eggs, and co-operative slaughter houses for pigs. There are co-operative credit societies to lend money to the farmers to enable them to stock their farms with the best kinds of cattle, and to build their dairies and equip them with machinery. The Danish people are well educated, and there are colleges to teach the best methods of rearing animals and making dairy produce.

On account of the sterile soil and damp climate agriculture is not so important as dairying. But the soil has been improved by artificial manuring, and large crops of oats, barley, rye, beet-roots, potatoes and fodder plants are grown. Very little wheat can be grown and so it has to be imported.

Copenhagen (which means the merchants' haven), the capital of Denmark, commands the Sound, the more direct route to the Baltic. It is a great collecting and distributing centre for the dairy produce of Sweden and Russia. The *Kiel Canal* (German) gives a much more direct entry to the Baltic Sea; still Copenhagen is important as being the capital of the country and has about half-a-million inhabitants.

GERMANY (Fig. 28)

Germany falls into two main physical divisions: the *Northern Plain* and the *Southern Highlands*. The North Sea coastal plain is below sea-level and protected by sand dunes and dykes as in Holland. These low plains have been drained, and form good agricultural land. Behind the fenland is a region of moorland and heath. The Baltic coast is higher, but it is sandy; hence there are very few harbours. The river mouths are obstructed by sandbars, so that they form enclosed lagoons, called *haffs*. The land behind the coast is covered with sand and clay deposited by glaciers. In some places these glacial deposits form low hills, called the Baltic Heights. These heights are wooded with beech and pine, and contain a very large number of small lakes. It is the presence of these heights that makes the rivers of Germany suddenly change direction in their middle

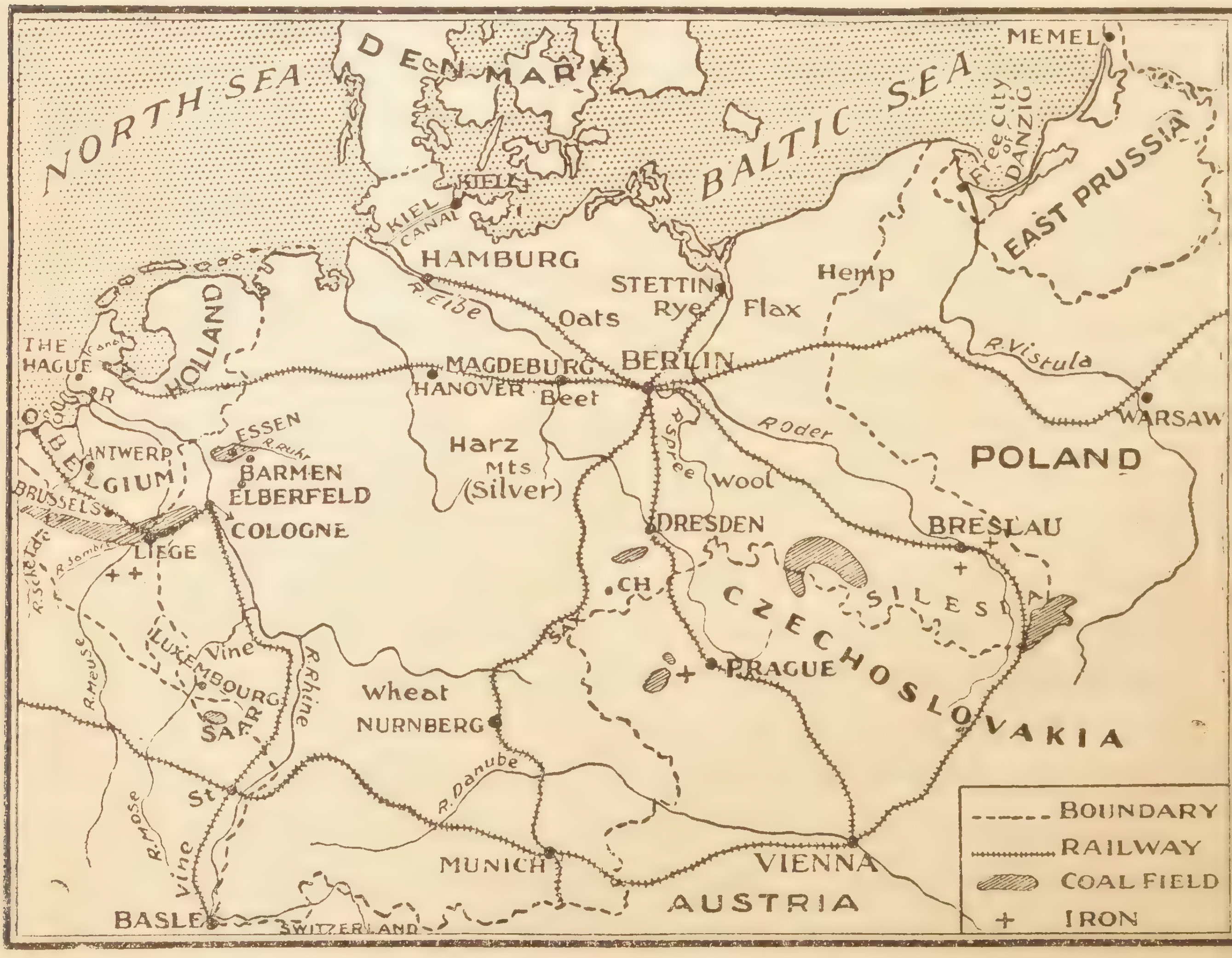


FIG. 28. Belgium, Holland and Germany: Railways and Minerals.

courses, *e.g.*, the Elbe. The sandy regions are poor, but are used for potato growing, while the clayey regions are richer and are devoted to the growth of beet.

The Southern Highlands are a part of the Central European system. The Lower Rhine Highlands, the Black Forest, the Harz mountains, the ridges bordering the Bohemian plateau and a small portion of the northern Alps are included in this highland area.

The German rivers have east and west flowing tributaries which have aided the construction of canals between the different rivers. The great German rivers, namely, the *Rhine*, *Elbe* and *Oder*, have been internationalized.

Mining and Manufacturing: Germany is generally described as an *industrial nation* as more people are engaged here in mining and manufacturing than in any other industry. There are three coalfields : (i) The Ruhr Valley coalfields, (ii) the Saxony coalfield, and (iii) the Silesian coalfield. New Germany has been deprived of the Saar Basin coalfields and the iron mines of Lorraine.

The Ruhr Valley Coalfield is the chief industrial area in the country, and one-fifth of the total population is concentrated there. Iron is also found, but much has to be imported. The Rhine is an important waterway through which are imported the iron ores, as well as raw materials for the textile trades (cotton, wool, etc.) and grain for food. The *Krupp* iron and steel works, in which all kinds of war material are manufactured, are at *Essen*. *Dortmund* has hardware industry, and chemicals and glass are manufactured at *Dusseldorf*. *Elberfeld-Barmen* is noted for its silk, cotton and woollen goods. *Krefeld* is famous for its silk and velvet manufactures.

On the *Saxon Coalfield*, *Chemnitz* is an important textile manufacturing town. It specialises in shawls and hosiery. The raw cotton is received by rail from Bremen, and much of the wool is obtained locally. The famous *Dresden China* is made at *Meissen. Leipzig* is not on the coalfield, but is one of the most important cities of Germany. It has extensive printing works and makes all kinds of musical instruments.

Breslau, in Silesia, is an important woollen manufacturing centre, the raw material being not only obtained locally but also imported from Argentina and Australia.

The Harz mountain's are an important mining centre, where iron, silver and other minerals are mined. Near *Strassfurt* are deposits of rock salt and potash ; hence the town has great chemical works where chemicals for use in textile industries and artificial manures are prepared. It is to these chemical manures that German agriculture largely owes its progress.

Agriculture: The Northern Plain, though naturally infertile except in places covered with clay, has been made productive by scientific agriculture. *Rye*, *oats, potatoes* and *beet* are the chief crops. Rye is used for making *black bread*, potatoes for making starch and for distilling alcohol, and beet for making sugar and also for distilling. *Magdeburg*, on the Elbe, and *Frankfurt*, on the Oder, are the chief sugar-refining towns. In the south where the soils are better, more *wheat* and *barley* are grown than rye and oats. In the north-east *flax* and *hemp* are grown and exported. The most fertile parts are the Rift Valley of the Rhine and the other river valleys of the south-west. The *Vine* is grown on the sunny hill sides, and hops and tobacco are cultivated in Bavaria where beer-making is an important occupation. Fruit trees of many kinds (apple, pear, plum and cherry) are also widely cultivated.

Cattle are kept in all parts of the country, both for milk and dairy produce and also for meat. Silesia and Saxony are the chief *sheep-rearing* regions. The number of *pigs* has greatly increased as they can be fed on the potato and beet waste.

The *forests* of Germany are well looked after, and valuable timber is obtained from the Southern highlands. These forests have led to the development of the *toy* industries of *Nuremberg* and other towns. Clocks, surgical, and musical instruments are also made in some of the toy-making centres.

Berlin, the capital, is the centre of the railway system of the country. It occupies a central position in the northern plain. Find from the map the railway 'routes' that meet at Berlin. As a large centre of populations Berlin has become a great manufacturing city. The chief port of the country is *Hamburg*, at the head of the estuary of the Elbe. Its hinterland includes not only the whole of the Elbe basin, but also the middle and upper basin of the Oder. It is also a great industrial centre engaged in ship-building, wheat-milling, soap-making and other industries. It carries on the bulk of Germany's trade with America. The Elbe estuary is connected with the Baltic Sea by two canals, one from *Hamburg* to *Lubeck*, and the other, the famous *Kiel Canal*. The latter is a ship canal that is now open to the ships of all nations.

The New Germany: As a result of the Great War, the German people overthrew their rulers and established a Republic. By the Treaty of Versailles, 1919, great alterations were made in the territory belonging to Germany. All her over-seas colonies passed to the rule of Britain, France, Belgium or Japan, under mandates of the League of Nations. Alsace-Lorraine, the Saar basin, German Poland, and the ports of Danzig and Memel were lost. East Prussia was cut off from the rest of the country by the Polish "Corridor." To make reparation for the damage done to other states during the war, Germany was called upon to pay large indemnities. All these losses are a serious handicap to New Germany, but the careful and scientific industry which is characteristic of the German people will again make them take a leading part in the world's affair.

New Germany is about half as large again as the British Isles, and its population is about 56 millions.

EXERCISES

(1) State the importance of the Carcassone and Burgundian Gates.

(2) What are the three climatic regions of France? What are the characteristic productions of each region?

(3) Which is the most important industrial region of France? Why? Name the chief towns and the industries carried on there.

(4) 'Rouen has cotton manufactures, though it is far away from the coalfields'. Why?

(5) Point out the importance of the position of Paris, Lyons and Marseilles. Draw a sketch map.

(6) Why is Belgium one of the most densely peopled countries in the world? In which part of the country are the people specially concentrated?

(7) Why has Antwerp a large transit trade for Germany?

(8) What industries are carried on at Ghent? Why?

(9) Describe how the Dutch have reclaimed land from the sea. What effect had this work on the character of the people?

(10) Why is it that a small country like Holland has such important colonial possessions?

(11) Though Holland is not an industrial country, its trade shows a large import of raw materials for manufacture. Account for this.

(12) Give an account of the co-operative system of dairying in Denmark.

(13) Draw a map of Germany showing the old as well as the new boundaries. Shade the portions that have been lost by new Germany.

(14) Which is the largest industrial area of Germany? Mention the chief towns with the industries that are carried on there.

(15) Show how geographical conditions have made Berlin and Hamburg very important towns.

(16) In what direction do the tributaries of German rivers flow? How has this helped the construction of canals?

CHAPTER VI

THE BALTIC REGION & THE NEW BORDER STATES

SCANDINAVIA (Fig. 29)

The Scandinavian Peninsula consists of *Norway* and *Sweden.* Norway is a rugged country, its coast being indented with innumerable fiords. These fiords are narrow and steep-sided. At the head of the fiords, there are small lowlands worn by glaciers. These lowlands are important as they form small agricultural lands amid mountains. The *skerry guard* of islands lie close to the coast and afford protection from the Atlantic waves and storms. Hence the waters between the islands and the coast and within the fiords are very calm. The coasts and islands of Norway are high and barren so that man is forced *to find his means of livelihood on the sea.* The fiords are the training grounds for the *fishermen* and *sailors* for whom Norway is noted. The chief fishing centres of Norway are *Bergen* and the *Lofoten islands.* Cod and herring are the chief fish caught; and large numbers of people are employed in drying or salting the fish, and extracting cod-liver oil. The coast of Sweden, also, is rugged and has its island fringe; but the coasts and the islands are low and wooded. Large quantities of fish are exported to the Roman Catholic countries of southern Europe. The rivers of Scandinavia are generally swift, but the Norwegian rivers are shorter and swifter than those of Sweden owing to the nearness of the water-shed to the Atlantic.

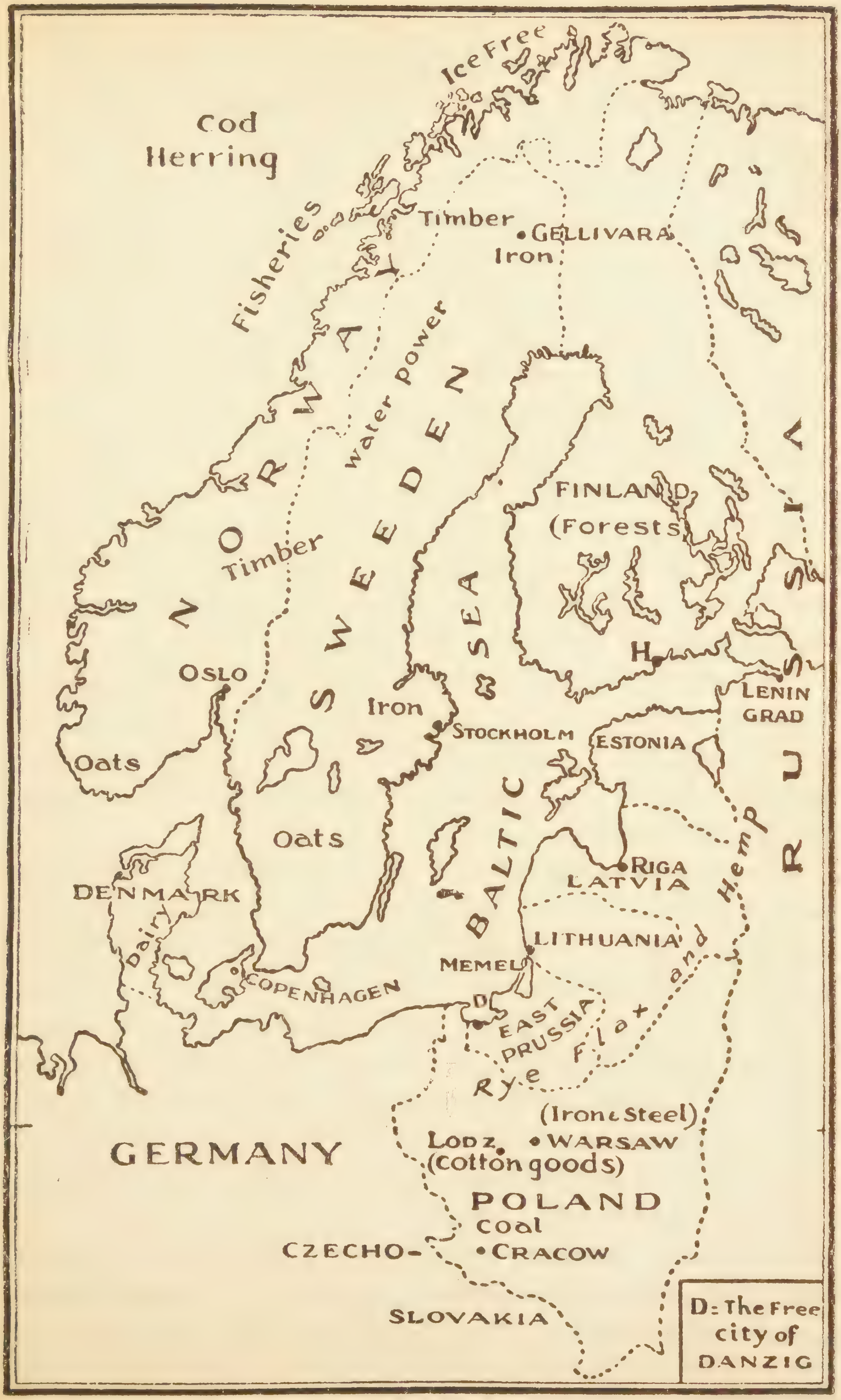


FIG. 29. THE BALTIC STATES.

The longer Swedish rivers are employed in transporting timber from the forests to the coasts. In both countries the rivers are of great value as *sources of power.*

Sweden has much more extensive and more valuable *forests* than Norway. Except in the south, coniferous forests prevail. The rivers provide power to work saw-mills and pulping mills. One-fifth of Norway and over one-half of Sweden are forested. Hence Sweden exports more timber and wooden goods than Norway. *Match-making* and the making of *wood-pulp* and *paper* are industries connected with lumbering. The factories are worked by electric power supplied by the numerous water-falls. Timber is not exported "raw" but is made into furniture, doors, window-frames and other articles before exportation.

Closely related to fishing and forestry is the *ship-building* industry. Norway is one of the leading ship-owning countries in the world. The ships are generally made of wood ; the wooden ships of Sweden are engaged in the Baltic trade.

In respect of *agriculture,* Sweden has great advantages over Norway. Why ? Oats, rye and barley are grown, rye being used for making "black" bread. *Pastoral work* is more important than agriculture. In the southern part of Norway and Sweden dairy-farming is the leading industry, and considerable quantities of condensed milk and butter are exported, especially to England. Most of the dairies are carried on by co-operation. In Norway where the hill pastures are poorer, there are more sheep than in Sweden.

Another important industry in the peninsula is *mining.* Sweden has high-grade iron ore in the districts of *Dannemora* and *Gellivara.* The Swedish outlet for the latter field is ice-bound in winter, and therefore a railway has been built to the Norwegian port, *Narvik*, which is ice-free. Why ? As there is no coal in the country most of the iron ore is exported. Copper, silver and zinc are also mined. A considerable smelting is carried on with the help of charcoal.

The chief manufacturing industries are those connected with timber and wood-pulp. With the development of their water-power, both countries may increase their manufactures. Cotton is manufactured at *Goteborg.* Cotton spinning and weaving can be established on a large scale in Norway on account of its water-power and damp climate.

Norway (124,000 square miles) has a population of only about 2½ millions, and Sweden (173,000 square miles), about 6 millions. In Norway most of the people live along the sea-coast and in the Glommen valley.

Oslo, the capital of Norway, stands at the head of the fiord of the same name. It is the southern outlet for the richest and most fertile part of the country, the Glommen valley. It is joined by a railway to Bergen. *Stockholm*, the capital of Sweden, stands on some islands at the entrance to Lake Malar. It has rail connections with Goteborg and Oslo. It has one disadvantage ; *i. e.*, its harbour is ice-blocked during the winter months.

THE BALTIC REPUBLICS

These include *Finland*, *Esthonia*, *Latvia* and *Lithuania*. All these became independent republics at the break up of the Russian Empire after the war.

Finland is a country of forests, lakes and rivers. The ground is covered with snow for nearly six months (November to April), and such a condition is not quite favourable to agriculture. Still parts of the country have been cleared and sown with *oats* and *rye.* Oats are used as food for animals so that many *cattle* are kept, and large quantities of *butter* are exported to Britain each year.

Forests of pine and spruce fir cover more than half the country ; and hence many people are engaged in cutting and dressing *timber* and in the manufacture of *wood-pulp* and *paper.* To a small extent water-power is used in these industries. Iron manufactures are increasing, as iron-ore is obtained in the southern part of the country.

Helsingfors, the capital, is on the Gulf of Finland in the centre of the most productive district, and has a very good harbour.

The country imports wheat, rye and other foodstuffs, iron, and cotton and chemicals for its textile industries. In exchange for these it exports timber, paper, some textile manufactures and some animal products. Along the coast many people are engaged in fishing. Finland is as large as the British Isles, but the population is only about 3 millions. You know that the Finns are of Asiatic origin.

Esthonia, Latvia and Lithuania are three small republics south of the Gulf of Finland. The land of these states is not on the whole fertile ; a considerable proportion of it is still covered with forest. *Rye* is everywhere the chief crop ; *oats* and *barley* come next. *Potatoes* are grown partly for food, and partly for distilling alcohol. *Flax* is another important crop; much of this fibre is exported, to be used in the linen factories of Belgium. *Dairy-farming* and *poultry-rearing* are also important occupations.

Minerals are almost entirely lacking, and manufactures are very little developed. A little cotton and linen manufacture is carried on at Riga and other ports.

Riga, the capital of Latvia, was one of the chief ports of Russia. *Reval,* the capital of Esthonia, is ice-blocked for a longer period than Riga. *Vilna* is the capital of Lithuania, and *Memel*, the chief port. Timber and flax form important exports of the ports.

POLAND

Poland which consists mainly of the basin of the Vistula, has a total area of 150,000 square miles, and a population of 27 millions. For over a century it has been divided among Russia, Prussia and Austria. After the collapse of the Russian power in the Great War, Poland obtained its independence. It occupies a very important position as a *buffer state* between Russia and Germany ; but there are no natural boundaries on the east and west.

The northern part of the country is a plain like eastern Germany and forms the chief *agricultural* part of the country. *Rye* is the most important crop, being the staple food of the people. Some oats, barley and wheat are also raised. *Sugar-beet* is grown on a large scale.

In the south land rises gradually to the Carpathians. The southern part is very rich in *mineral wealth.*

Coal, iron, lead, and zinc are mined near *Cracow.* In this district, called Upper Silesia, there are many iron and steel works and glass factories ; to the south-east, near the headstreams of the Dniester, there is a line of *oil* wells of great importance.

To a considerable extent, the southern highlands are wooded. Here wood-working is an important occupation.

The chief industrial centre is *Lodz* which is noted for its *textile industries.* Wool and flax are produced locally, and cotton is imported *via* the Vistula. *Warsaw*, the capital of Poland, stands where the railway from Berlin to Moscow crosses the Vistula. It has some iron and steel works, sugar refineries, and leather and textile industries.

Its outlet to the sea is by way of the Vistula "Corridor" to Danzig. *Lemberg* which commands important routes, has also textile industries.

Danzig, a German city by population, has become the "Free City of Danzig" under the protection of the League of Nations. It has its own Government for local affairs, but Poland has freedom of access through the port, and has control over its railways, docks and trade. It exports grain, timber and sugar and manufactured goods. It has large ship-building yards, and is connected with the interior by rail and the Vistula.

EXERCISES

(1) "The Norwegian ports are ice-free, while the Swedish ports are ice-bound in winter." Why?
(2) Why are the Norwegians mostly fishermen and sailors?
(3) What possibilities are there for the establishment of cotton spinning and weaving on a large scale in Norway?
(4) Mention all the industries connected with the forests of Sweden.
(5) Why is most of the iron-ore of Sweden exported?
(6) Give an account of the economic resources of Finland.
(7) For what purposes are potatoes and flax grown?
(8) How does the position of Warsaw make it fit to be the capital of Poland?
(9) What is meant by the Vistula "Corridor"? What is its importance?
(10) What facilities are there for the establishment of textile industries at Lodz?

CHAPTER VII

THE CENTRAL HIGHLAND STATES OF EUROPE

These include the republics *Czecho-Slovakia*, *Austria* and *Switzerland*, and the kingdom of *Hungary* (Fig. 30). Hungary is a great plain around the middle Danube and its tributary the Theiss, while the other states are very mountainous.

CZECHO-SLOVAKIA

This has an area equal to that of England and Wales, and a population of about 14 millions. It is composed of three portions: (1) the diamond-shaped "head" of the *Czech* lands including *Bohemia*, *Moravia* and a part of *Silesia*; (2) the oval-shaped "body" of the *Slovak* lands; (3) the narrow "tail" of *Ruthenia*.

The diamond-shaped Bohemia plateau is the most densely populated portion of the state; it has nearly 10 million people, of whom three-quarters are Czechs; the central region consists mostly of Slovaks; and the Ruthenians form the majority of the "tail". These lands were formerly part of Austria-Hungary. The new state has no coast-line and no seaport, but she can use the Elbe, the Oder and the Danube which have been internationalized. She has also access to the Adriatic ports through the Austrian railways.

The most fertile parts of Bohemia are the valleys of the Upper Elbe and its tributaries. *Wheat*, *barley*, *sugar-beet*, *hops* and *fruit* are grown; on the plateau *rye*, *oats* and *potatoes* are cultivated. *Cattle* are also kept in large numbers. The northern portion of Moravia, has the same productions as Bohemia, but in the warmer south, *maize* and the *vine* are found. In Slovakia, the Danubian lowlands are very fertile and produce all the grain crops of the continent—maize, wheat, barley, rye, oats. Fruit, tobacco and wine are also obtained.

In all parts of Czecho-Slovakia *forestry* is important; consequently, *timber* is an important item of export.

Bohemia is exceedingly rich in *minerals*; so that its industries are highly developed. *Coal* and *iron* are mined near *Pilsen* and *Prague*. *Beet-sugar* and *iron* and *steel* goods are manufactured at Prague; the making of *beer* (based on hops and barley) is centred especially at Pilsen. There are also paper and leather works in both the towns. *Porcelain* and *glass* are among the chief industries of Bohemia; they are carried on in the north-west, especially in the Eger valley where *kaolin* (China clay) as well as coal is obtained. Cotton and woollen goods are manufactured in the north-east, aided by coal, found in the north-west, and water-power from the mountain streams.

Prague, the chief city, stands on a tributary of the Elbe in a fine central position upon which the chief routes converge. It is at the head of river navigation. *Brunn*, the chief town of Moravia and the second city in Czecho-Slovakia, has coal and iron near it; hence it has woollen and sugar-refining industries and makes the machinary required for these industries.

Slovakia is rich in minerals such as iron, copper, zinc and manganese, and water-power is abundant.

The chief routes by which trade is carried on with other countries are: by the Elbe, by the Danube and through the Moravian Gate.

AUSTRIA

The new state is only a fraction of the old one. Its area is equal to that of Scotland, and its population is about 6½ millions. Most of the inhabitants are Germans.

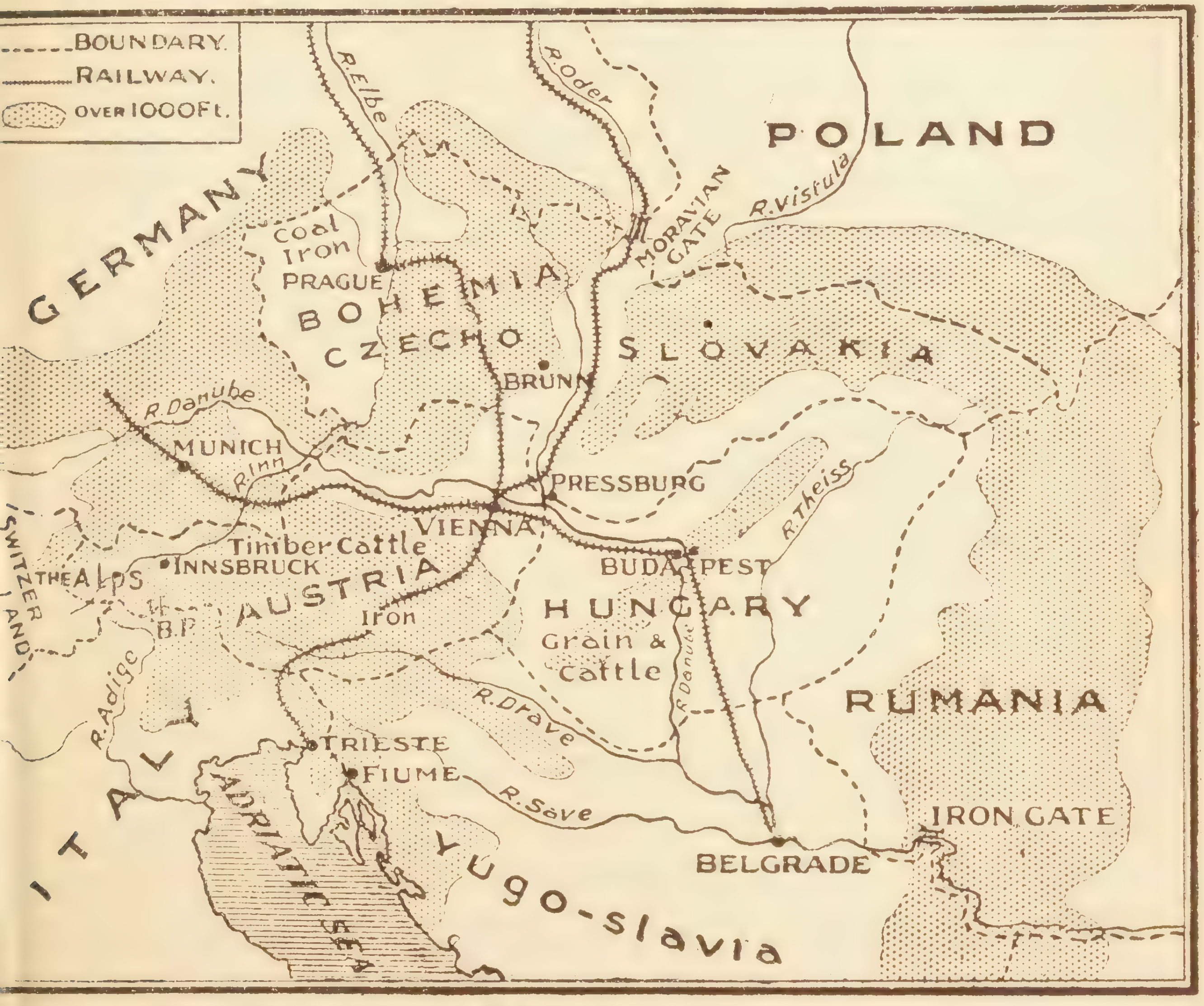


FIG. 30. AUTSRIA, HUNGARY and CZECHO-SLOVAKIA.

More than half of this country consists of a rugged Alpine region. *Agriculture* is restricted to the valleys, and the high pastures are important for summer *dairy-farming.* The mountain *forests* are a source of great wealth, and large quantities of timber are floated down the east-flowing rivers to the plains.

Minerals are abundant in some parts, and this has led to several manufacturing industries. At *Salzburg* (=Salt-town), salt is mined and manufactured. At *Eisenerz* (=Iron-ore) in Styria, iron is mined and smelted. *Graz,* the second city in Austria, is an important iron-smelting and manufacturing centre in eastern Styria. The industries of Austria are, however, small as its coal resources are very limited ; but there is abundance of *water-power* in the province adjoining Switzerland. The only large town in the Alpine region is *Innsbruck* on the Inn. Its growth was assisted by trade over the *Brenner Pass*, from Venice. It is also a convenient centre for *tourists* in the Tyrol.

The only lowland in Austria is a small area around Vienna on the Danube. *Vienna*, the capital of Austria, stands at a place where several important routes converge ; (i) from Bavaria *via* the Danube and the Austrian Gate ; (ii) from Berlin *via* Dresden, the Elbe and Bohemia ; (iii) from Poland and Russia *via* the Moravian Gate and the March ; (iv) from the east *via* Hungarian and Carpathian Gates ; (v) from Venice and Trieste *via* the Semmering Pass. Vienna is a great manufacturing city noted for furniture, metal goods and leather goods. It is a city of about two million people, and the new Austria is too poor to support such a dense population. Further up the Danube stands *Linz*, the third city of the state.

HUNGARY

This has been reduced to a small state, little larger than Austria in area, and it has a popoulation of about 8 millions. The *Magyars* from the bulk of the people.

A very large proportion of the country is lowland, and the climate is extreme and the rainfall light, so that the natural vegetation is *steppe*. Until the middle of the nineteenth century, it was mainly a pastoral country over which herds of horses, cattle, and sheep wandered. Now no less than two-thirds of the country is under cultivation, so that half of the people are engaged in *agriculture*. Enormous crops of *maize* and *wheat* are grown so that Hungary is one of Europe's richest granaries. The wheat crop is sufficient for a population three times that of Hungary, so that the surplus is exported to the neighbouring countries. Rye, barley and oats are obtained to a less extent, while beet, potatoes and tobacco are also grown. The *Vine* is cultivated on the southern slopes of the mountain districts ; *Tokay* near the northern boundary is famous for its wine.

Pastoral occupations are still of great importance ; millions of cattle, horses, sheep and pigs are reared, and the country is noted for its breed of lightly-built horses.

Manufacturing is little developed, as there is very little coal in the land. Only industries connected with agriculture are carried on, *e.g.*, flour-milling, sugar-refining, tobacco-manufacturing and brewing.

Buda-Pest, the capital of Hungary, consists of two cities on opposite banks of the Danube connected by fine bridges. Railways from various directions converge upon it ; (i) from Vienna in the west ; (ii) from Fiume, the Adriatic port ; (iii) from Belgrade and the Moravian valley ; (iv) from the Iron Gates and the lower Danube ; (v) from Cracow and Lemberg on the other side of the Carpathians. The city has flour-mills and leather works.

Both Austria and Hungary are now entirely inland states, but they have the right of access to the Adriatic ports of the former Austria-Hungary.

SWITZERLAND

This is the most mountainous country in Europe. It is about 16,000 square miles in area, and has a population of nearly 4 millions. It falls into three physical divisions :

(i) the Jura mountains in the north-west; (ii) the Alps in the south; and (iii) the central plateau separating the two, stretching from Lake Geneva to Lake Constance. All the important towns are on the plateau.

The Alps are the highest and most massive of the fold mountains of Europe. The valleys in the Alps serve as roads connecting the populated areas on either side of the mountain barrier. Fig. 31 shows the routes across the Alps. These routes may be considered as going out from the plain of northern Italy as a centre.

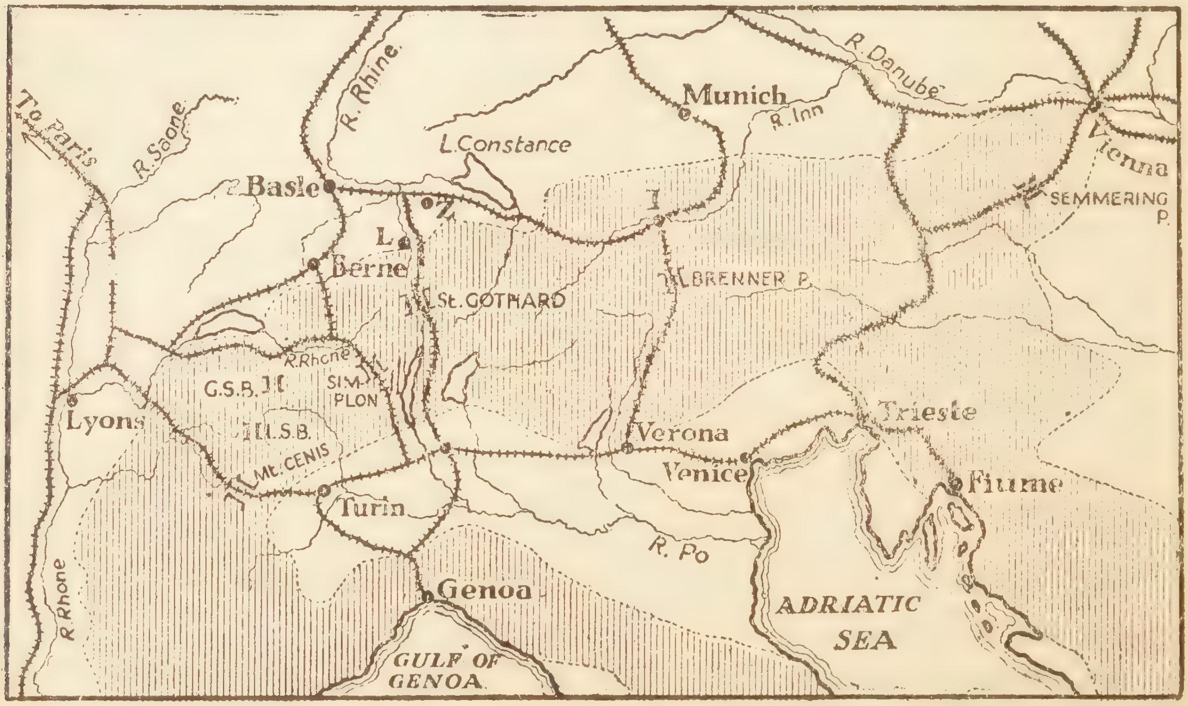


FIG. 31. Routes across the Alps.
The shaded area represents highlands.

(1) From Turin a route goes westward, and the railway which follows this route passes through the Mount Cenis tunnel (7½ miles) and reaches Lyons on the Rhone.

(2) The routes across the Great St. Bernard and Little St. Bernard Passes have carriage roads and not railways.

(3) From Milan a railway goes along the west side of Lake Maggiore and by the Simplon tunnel (12¼ miles) to the Upper Rhone Valley. From here one line goes westward

along the river valley to Geneva, while another line crosses the Bernese Oberland by a tunnel to Bern, the capital of Switzerland.

(4) Another railway goes along the east side of Lake Maggiore up the Ticino valley and by the St. Gotthard tunnel (9½ miles) to the valley of the Reuss which leads to the Rhine valley.

(5) The next railway route goes from Verona up the Adige valley and by the Brenner Pass to the valley of the Inn at Innsbruck. From here routes go westward up the Inn valley to the Rhine, and eastward down the Inn valley to Munich.

(6) The last route goes from Trieste across the Eastern Alps and by the Semmering Pass to Vienna.

Of these, the two that are directly concerned with Switzerland are the Simplon and St. Gotthard routes.

Industries: More than a quater of the country is unproductive mountain land, and less than a quarter is forested. The rest of the country is half agricultural land and half pasture land.

Agriculture is carried on in the valleys or on the plateau where there is fertile glacial soil. Rye, oats, wheat and potatoes are the chief crops. The vine is cultivated on the sunny mountain slopes. Switzerland does not grow enough produce to support her population, and has therefore to import large quantities of cereals and other food-stuffs.

But the main occupation of the country people is *dairy-farming.* There are about two million cattle in the country as well as large numbers of pigs and goats. In the Alpine section, the cattle spend the winter in the valleys where they are fed with hay gathered and stored at the end of summer. In spring they are driven to the high mountain pastures-*the Alp*-where they remain until the end of summer. In some cases the whole population migrate with their herds, but in other cases the greater part of the population remains in the village, and only a few herdsmen go to the Alps. Here they live in wooden huts or *chalets*, where butter and cheese are manufactured, and return with the cattle in the autumn. Much milk is *condensed* or used in the *chocolate* industry, the sugar and cocoa required for the latter industry being imported.

Goats are kept on the high pastures, and pigs are also reared.

Switzerland is a very important *manufacturing* country importing foodstuffs and raw materials for manufacture, and exporting manufactured goods. It is remarkable that a country possessing very little mineral wealth, especially of coal and iron, and having neither coast-line nor navigable rivers should have become a manufacturing state. Most of the manufactures began as domestic industries even before the use of water-power was known. Now they have been developed by the help of *hydro-electric power*, the cheapest motive power in the land. Even small village houses are lighted by electricity. Another great factor is the development of education, especially technical education for special industries. As both coal and raw materials have to be imported, and as the cost of transport over a mountainous country is naturally heavy, only articles which require relatively little raw material, but which require much labour and great skill, are manufactured: *e.g.*, *watches*, *clocks*, and *musical boxes*. Moreover, these articles can be transported through foreign countries at low cost.

Watches and clocks are made in towns lying along the base of the Juras, *e. g.*, *Geneva* and *Newchatel*. *Silk* and *cotton* industries are carried on at *Zurich*, *Berne*, *St. Gall* and *Basle*. The silk comes from the Mediterranean region *via* the Alpine tunnels and cotton by the Rhine valley. The navigation of the Rhine has now been extended to Basle, and docks have been constructed at this town. Hence Switzerland has direct water communication with the North Sea.

The development of hydro-electric power has led to a special industry, the making of hydraulic and electric appliances at *Berne* and *Zurich*. *Zurich*, the largest town in Switzerland, is the chief manufacturing centre ; next in importance are *Basle* and *Geneva*. The importance of Geneva has increased, as it has been made the seat of the *League of Nations*.

Switzerland has been called the *Playground of Europe*. The natural beauties of snow-clad peaks, glaciers, waterfalls and lakes, are so great that thousands of tourists from all parts of Europe and America visit the country every year. There are many tourist centres with large hotels. Hence thousands of men and women in Switzerland find employment as hotel-keepers, waiters, servants, guides, etc.

EXERCISES

(1) Which part of Czecho-Slovakia is most densely peopled? Why?

(2) Why is Hungary "one of the richest granaries" of Europ?

(3) What is the population of Vienna? Why is the city so large? Can it be supported by the present Austria?

(4) Draw sketch maps to illustrate the sites of Vienna, Buda-Pest and Prague.

(5) Why is Switzerland called the "Playground of Europe" What is meant by the "**Tourist Industry**"?

(6) Discuss the advantages and disadvantages possessed by Switzerland for her modern rise as a manufacturing country.

(7) What kind of manufacture, can be successfully carried on in Switzerland? Why? What country does it resemble in this respect?

(8) Mention the chief railway routes across the Alps. Draw a sketch map showing the routes.

(9) 'Swiss life in the Alpine region is semi-nomadic.' How?

(10) What has contributed to the importance of Geneva?

CHAPTER VIII

THE MEDITERRANEAN REGION

The lands bordering the Mediterranean Sea have the *Mediterranean type* of climate, i.e., *a warm, wet winter and a hot, dry summer* ; and the products are also " Mediterranean" in type (*Vide* Mediterranean Region in Africa).

THE IBERIAN PENINSULA (Fig. 32).

This has a total area nearly twice that of the United Kingdom. It is made of the *republics of Spain* and *Portugal*. Spain has a population of 25½ millions, and Portugal 6 millions.

Three-quarters of the Peninsula consists of the *Meseta*, an ancient plateau block crossed by saw-like ridges, called " Sierras ", which separate the basins of the *Douro*, *Tagus* and *Guadiana*. The plateau slopes westward so that all the rivers flow westwards. They flow through deep narrow valleys and are interrupted by falls and rapids where they leave Spain for Portugal. The frontier between the two countries roughly coincides with the western edge of the Meseta. Hence the Spanish portions of the rivers are of little use either for navigation or for irrigation. The plains are comparatively small, and are to be found in the valleys of the *Guadalquivir* and the *Ebro*, and along the west coast.

The north and north-west have the Western European type of climate; the central plateau has extremes of temperature and a lack of rain; the south-west has a

Mediterranean climate and is relatively fertile; and the south-east is drier but can be made productive by irrigation.

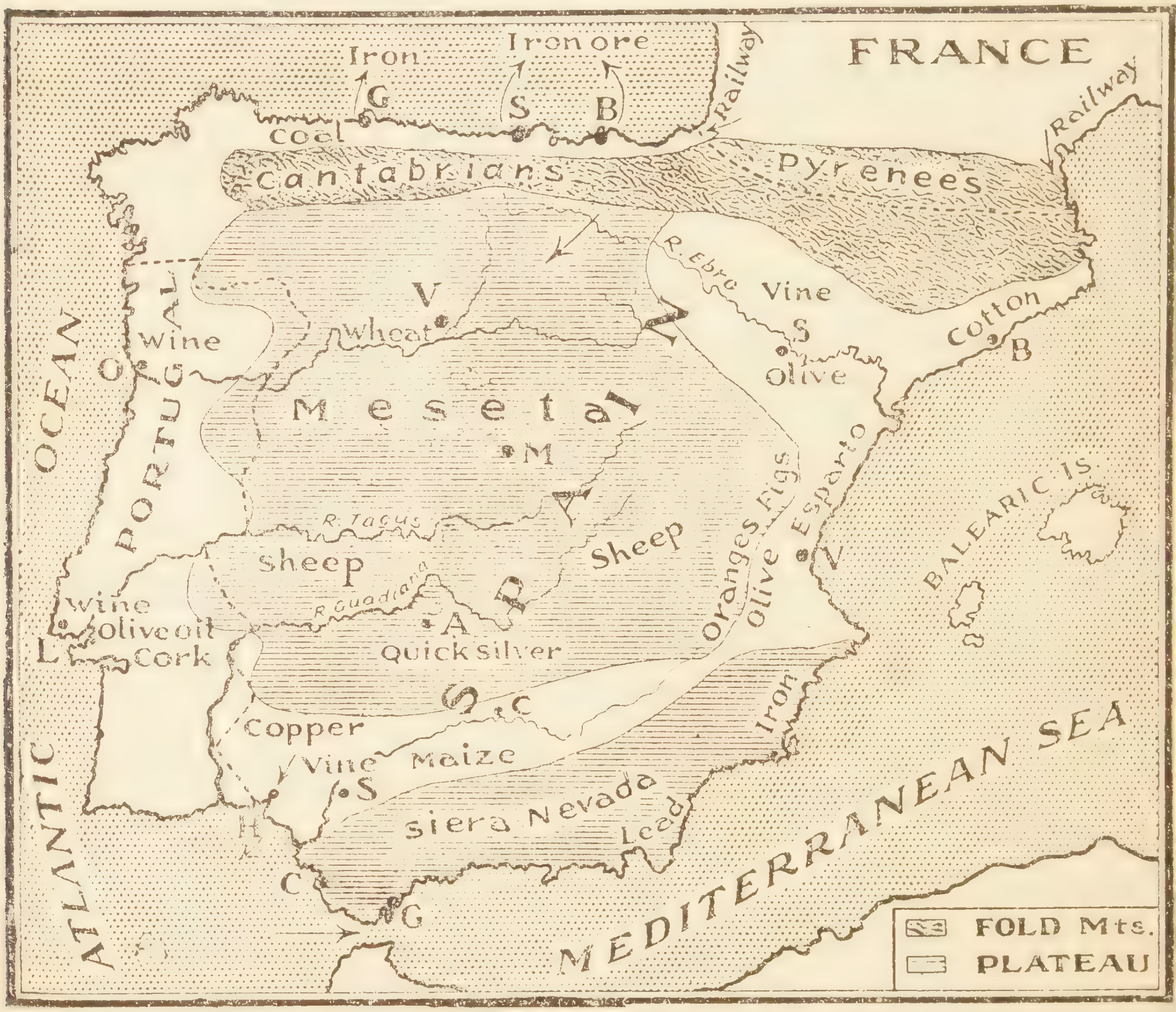


FIG. 32. SPAIN and PORTUGAL.

Spain : The Meseta, on account of its extremes of temperature and drought, is of little value for agriculture, and much of it is useful only as poor pasture land. Hence *pastoral occupations* are carried on, and more than one-half of the sheep of the peninsula are pastured here. Goats are also reared in large numbers. Spain has long been famous for its *merino* wool. Large areas in the upper Douro and Tagus valleys have been brought under cultivation by means of irrigation, and *wheat* is grown in the district around *Valladolid* which is called the "Granary of Spain".

Madrid, the capital of Spain, occupies a central position and is the meeting place of routes coming from all parts of the plateau.

Many parts of the plateau are rich in *minerals* ; but they are not fully worked. *Quick-silver* is obtained at *Almaden*, north of the Sierra Morena, and *copper* at *Rio Tinto*, on the southern slopes of the same mountain. Much of the copper is exported to Britain through the port of *Huelva*. In the northern edge of the plateau are the *Cantabrians* which are one of the richest parts of Spain. This is due to the rich deposits of *iron ore* and also to the valuable forests. Large quantities of iron ore of the very best quality are mined in the mountains, and a certain amount is smelted at *Bilbao* and *Santander*, but, on account of the lack of coal, more is exported to South Wales. Some coal is mined in the district of *Oviedo*.

About three-quarters of the people depend upon *agriculture*. The plains of the Guadalquivir or *Andalusia* is one of the most productive regions of Spain. All the Mediterranean fruits, cereals and tobacco are cultivated. The olive is grown to a height of over 4,000 ft. on the southern side of the Sierra Nevada. *Seville*, the chief city, stands at the head of the ocean navigation of the river, and has various industries including the manufacture of iron mined in the Sierra Nevada. *Cadiz* exports fruits, wines (called 'sherry' from Xeres) and salt. As a port it has largely been superseded by Seville.

On the Mediterranean shores of Spain, the rainfall is deficient, and hence irrigation is necessary. The irrigated lands are called *huertas*, and the long, dry summers are suited to softer fruits. Hence the huertas, particularly those of Murcia and Valencia, produce mulberries, vines, oranges, lemons, figs, peaches, pomegranates, besides cereals (maize and wheat), and even some cotton, sugar-cane and rice. *Silk* goods are manufactured at *Valencia* and at *Murcia*.

Barcelona which is as big as *Madrid* is the chief port and industrial centre. Besides exporting wines and fruits it is engaged in the manufacture of *cotton* which is obtained locally.

The Ebro plain is a shut-up triangular basin having very little rain; hence its fertility is due to irrigation. Olives, vines, tobacco and cereals are grown. *Saragossa*, in the centre of the irrigated region, has sugar-refineries, and iron and steel manufactures.

Portugal has an equable temperature, an abundant rainfall and a rich soil; but her agriculture is much neglected as the education of the people is in a most backward condition. The vine is cultivated in all parts of the country. *Oporto*, at the mouth of the Douro, is the outlet for the famous "Port" wine. The forests of Portugal supply one-half of the world's output of *cork*, and the country has a flourishing cork industry. *Lisbon*, the capital, stands on the estuary of the Tagus. Its chief trade is in cork, fruit and the produce of the Portuguese African colonies.

The Pyrenees are an obstacle to communication with France. The railway lines from France to Spain have to cross the border at the ends of the mountain range, quite close to the coast. A new line has been constructed for fruit traffic, connecting the Ebro valley with Pau (France). It crosses the Pyrenees by a series of tunnels.

Gibralter is a fortress on the Rock of Gibralter (3 miles long, $\frac{3}{4}$ mile wide and $\frac{1}{4}$ mile high). On the north it is connected to the mainland by a low, narrow isthmus. Between Gibralter and Spain proper there is a small strip of neutral territory. Gibralter commands the western gate of the Mediterranean, and is a great naval station and coaling port. It has been British since 1704.

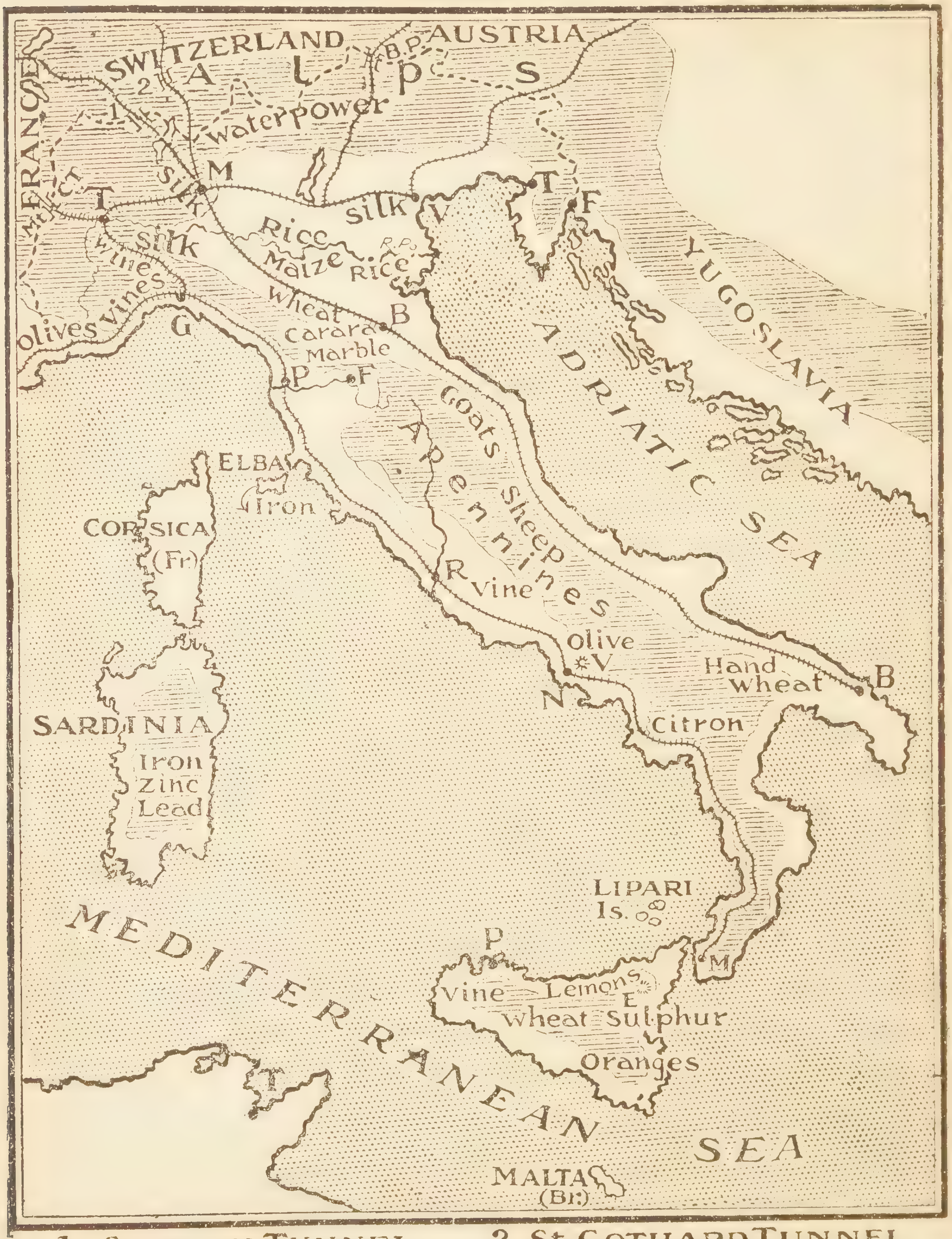
ITALY (Fig. 33)

Italy is as big as the British Isles and has a population of about 35½ millions. It falls into two natural regions: (i) *Continental* or *northern Italy* having a Central European type of climate with rain at all seasons, the maximum fall being in summer; (ii) *Peninsular* and *insular Italy* with a Mediterranean type of climate.

Continental Italy consists of the Southern Alps and the *plain of Lombardy.* This great plain which was once part of the Adriatic Sea, has been built by the deposition of alluvium brought down from the surrounding Alps and Apennines during long ages by the rivers. The plain is being extended eastwards by the *Po* and the *Adige* so that the filling up of the Adriatic is still going on. The lower part of the plain is marshy, with lagoons behind the coast. The bed of the Po, like that of the lower Mississippi, is higher than the level of the surrounding plain. So the river has to be kept in bounds by dykes.

The fine alluvial soil makes the plain exceedingly rich for *agricultural* purposes. Large crops of *wheat, maize, mulberries, grapes, hemp* and *flax*, and a small amount of cotton are grown. *Rice* is also cultivated on the low-lying land near the rivers and in the swampy districts of the delta. Irrigation is practised on a large scale. Both rice and maize form the chief articles of food. The mulberry is grown to feed the silkworm, and the *rearing of the silkworm* is an important occupation.

Cattle-rearing, *dairy-farming* and the rearing of *poultry* are extensively carried on, so that cheese, eggs and fowls are largely exported.



1. SIMPLON TUNNEL 2. St. GOTHARD TUNNEL

FIG. 33. ITALY: (Highlands are shaded.)

The plain of Lombardy has become an important manufacturing area, and large factories have been erected during recent years. The country has no coal, and large quantities have to be imported from Britain and U.S.A.; but the Alpine streams supply *hydro-electric power*. There are now nearly 400 power stations at work. *Iron* is obtained in the Alpine foot-hills and in the island of Elba. *Turin* and *Milan* are important *textile* manufacturing centres. The silk mills use the raw silk produced on the plains and also additional supplies from China. The cotton goods find a market in Argentina. These towns have also *engineering* and *steel* works.

The Alpine tunnels have greatly helped the development of Italy. (*Vide* the Alpine routes under 'Switzerland.') *Turin*, at the head of navigation of the Po, commands the route to the Cenis tunnel and the Rhone basin.

Milan stands at the point where the railway from Venice to Turin crosses that from Como to Genoa. The great routes *via* the Simplon and St. Gotthard tunnels converge upon it. *Venice*, the "Queen of the Adriatic", is built on over one hundred sandy islands on the edge of a shallow lagoon. Along with Genoa, it was an important trade centre in the middle ages for the goods of India and the East Indies; but both cities lost their importance after the discovery of the Cape route to India. Their importance has partially revived with the opening of the Suez Canal. As a result of the Great War, Italy has gained the Adriatic ports of Trieste and Fiume to which Austria, Hungary and Jugo-Slavia have access.

Southern Italy includes the peninsula and the island of Sicily. The Appennines run south-eastwards throughout the length of the peninsula. In some parts the mountains are of limestone especially near Naples. The beautiful bay of Naples is due to a basin-like subsidence. In the north, the limestone has been changed to marble which is extensively quarried near *Carrara*.

Several streams flow down the sides of the Apennines; the important ones are the Tiber on which *Rome* stands, and the Arno on which are *Florence* and *Pisa.* The rivers rapidly build out swampy deltas into the tideless Mediterranean; hence there are extensive marshy lowlands which are *malarial.* Every year many thousands of deaths are caused by malaria.

The valleys of the Arno and the Tiber are fertile and densely peopled. *Agriculture* and *fruit growing* are the chief occupations of the people of Southern Italy. Wheat and maize are the chief crops. Maize and the flour made from chestnuts are used as food. Grapes are widely grown, and Florence is in the midst of olive groves and vineyards. Olive oil, dried fruits and wine are exported from *Leghorn.* In the 'heel' of Italy, the dry climate favours the growth of the *hard wheat* which is suitable for the manufacture of macaroni.

Rome, once the capital of the great Roman Empire, is now the capital of Italy and the great city of the Tiber basin. It is at the meeting point of several routes. The mouth of the Tiber is silted up, and the port of Rome is *Civita Vecchia. Naples*, the largest town in Italy, has a good harbour and has textile, lace and engineering industries.

Sicily, a continuation of the Apennines, is separated from the 'toe' of Italy by the Strait of Messina which has been caused by faulting. This is a region of frequent earthquake shocks. The city of *Messina* on the mainland was largely destroyed by a great earthquake in 1908. It stands in a district famous for mulberries and hence has silk industries. *Palermo*, the capital, has orange and lemon groves.

Along the fault lines, there have been volcanic outbursts, and great *volcanic cones* have been built up

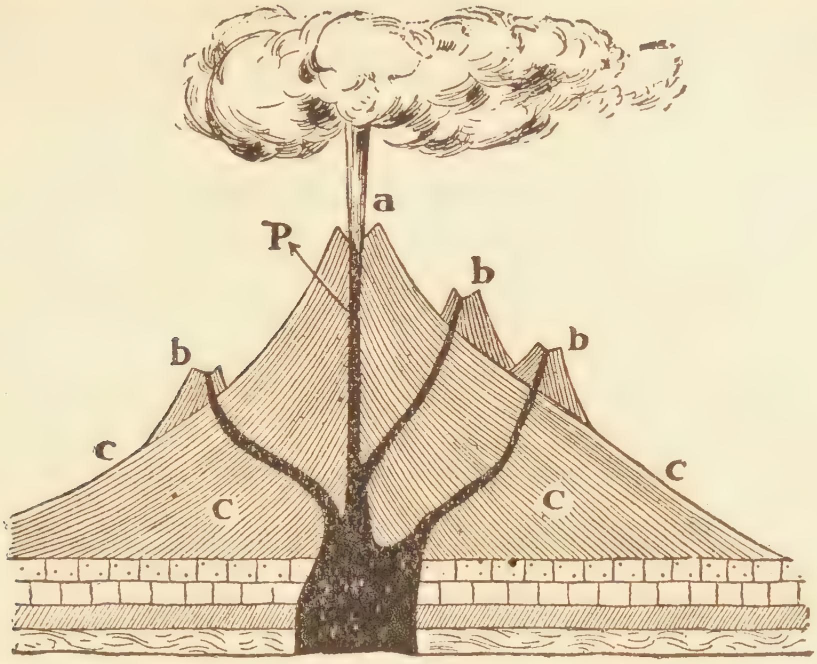


FIG. 34. Diagramatic section through a Volcano.

a is the main crater ; **b**, **b** are minor cones ; **c**, **c**, **c** are layers of lava and ashes of which the volcanic cone is made.
p, is the pipe or passage.

[Volcanic eruptions are usually heralded by earthquake shocks. During an eruption millions of tons of rock fragments are hurled into the air. A column of steam (miles high) rises from the crater, and spreads above in a cloud which condenses in torrents of rain. The various materials thrown out from the volcano arrange themselves round the vent in the form of a cone. Branch pipes give rise to minor cones on the slopes of the large one. Mount Etna has nearly 200 of these minor cones.]

(Fig. 34), such as that of Etna in Sicily, Stromboli in the Lipari Islands, and Vesuvius near Naples. *Sulphur* is an important mineral product of Sicily. Stromboli is called "the Lighthouse of the Mediterranean".

Corsica (politically a part of France) and **Sardinia** (a part of Italy) are remnants of an ancient block. They are forested and abound in minerals such as copper, silver and lead.

Malta is a group of islands commanding the straits between the eastern and western basins of the Mediterranean.

It belongs to Britain. The islands produce all the Mediterranean products. *Valetta*, the capital, has a magnificent harbour.

THE BALKAN STATES (Fig. 35).

These include the *kingdoms of Jugo-Slavia* and *Bulgaria*, and the *republics of Albania and Greece*. The western and southern parts of the peninsula have a Mediterranean climate, while the northern and eastern portions have a continental type of climate. The peninsula was once wholly under Turkish rule, and there have been a series of

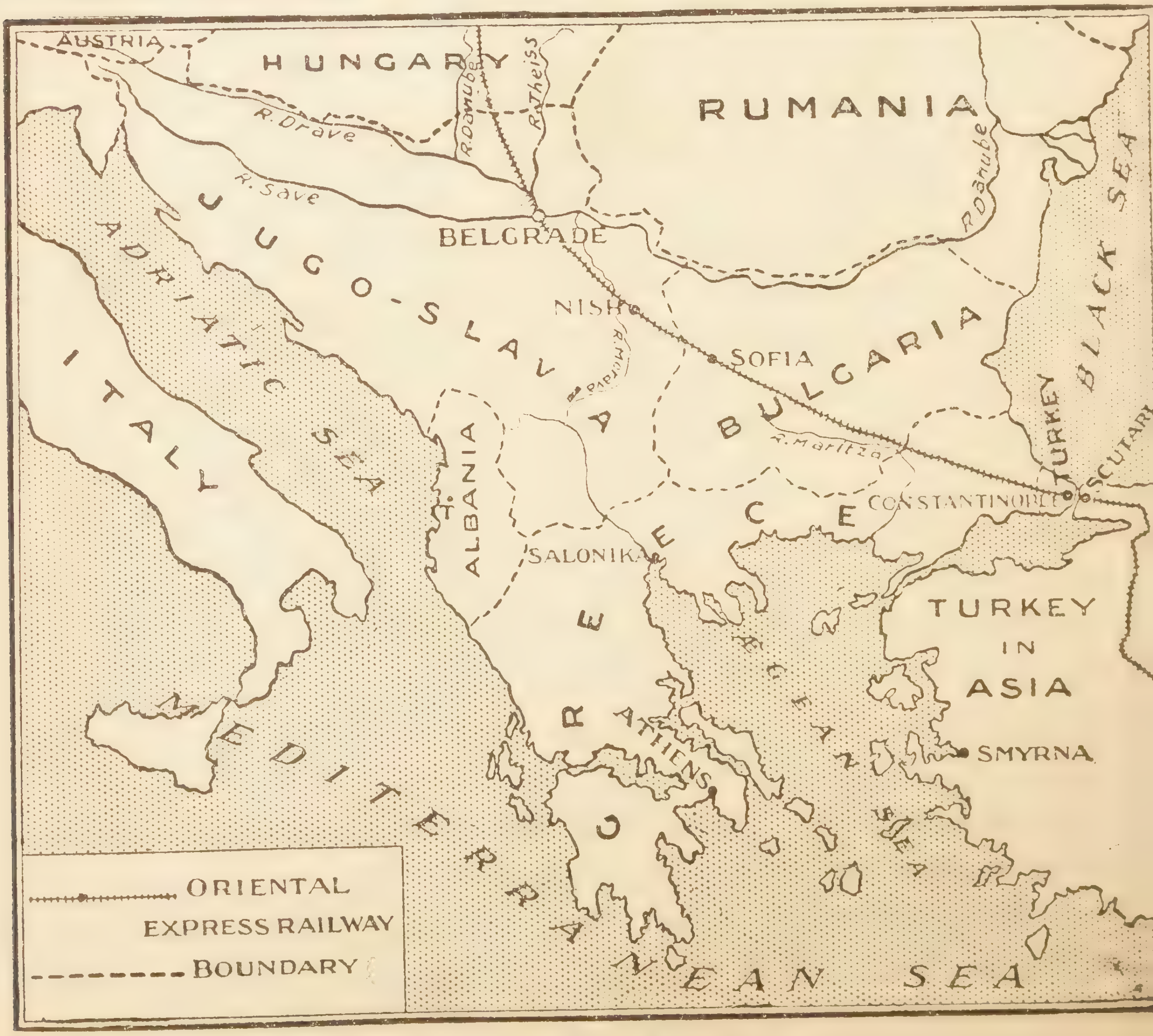


FIG. 35. THE BALKAN STATES.

political quarrels. These quarrels "have centred upon two matters : the inclusion of territory occupied by kinsmen, and the possession of easy routes to the sea."

Agriculture and pastoral work of a simple kind is almost the only occupation of the people.

(1) **Albania** is a small mountainous country with a population of less than one million. Cattle and sheep are reared on the mountains, and food crops are raised in the valleys. The people are industrious, but they have but little education. *Scutari* is the largest town.

(2) **Jugo-Slavia** has a population of about 14 millions. It is officially called "The Serb-Croat-Slovene State." The people are made up of three elements ; the Serbs, the Croats and the Slovenes. They differ in religion, but they are all Slavs. Along the Adriatic coast in Dalmatia vine is chiefly grown, and wine and olive oil are exported. The water-power of the coastal mountains are to some extent used in the making of chemicals. The limestone of the hills encourages *cement works.* The mountain forests yield valuable timber, and a number of people are engaged in timber industries. There are fertile lowlands beside the Danube and in the valleys of the Save and Morava. Wheat, maize, tobacco, vine and plums are cultivated. The oak and beech forests of the hills support large numbers of *pigs.*

Belgrade, the capital, is at the confluence of the Save and the Danube which is a great navigable water-way. The city is also on the Orient Express route to Constantinople *via* the valley of the Morava. At *Nish*, a line branches and runs down the Vardar valley to Salonika (Greece).

(3) **Bulgaria** has an area equal to that of Scotland, and a population of about five millions. The Balkans run

through the middle of the country with a lowland region on either side. In the northern area, wheat and maize are the leading crops. The southern area has vineyards, orchards of plums and peaches and plantations of tobacco and cotton. This region also produces wheat. The Balkans are covered with forests of beech and oak which support vast numbers of pigs. On the southern slopes of the mountains, *roses* are cultivated for the manufacture of attar of roses. "It takes 200 lbs. of rose petals to make 1 oz. of extract."

Sofia, the capital, stands at the position commanding *four valley routes.* The main Orient-Express route from Nish passes through this to the Maritza valley.

Varna is the chief Black Sea port.

(4) **Greece** is as large as England and has a population of about 6 millions. The mountains of Greece were once clothed with forests which have been removed, but now the people are giving attention to *tree-growing*. The coast line is very much broken, and this has made the Greeks a *sea-faring* people. The climate is of the Mediterranean type, and so the people follow the occupation of *fruit-growing* and the making of olive oil and wine. The chief crop is the *currant* (small dried seed-less grape) which is largely exported in return for wheat and manufactured goods. Tobacco and cotton are grown in plantations near the east coast, and wheat, barley and maize are cultivated in the lowlands near Salonika. Most of the tobacco is exported. In the highland areas sheep, goats and pigs are reared. *Athens*, the capital, stands about six miles from its port *Piraeus*, which has textile and engineering works.

A ship canal has been cut through the isthmus of Corinth, but it cannot accommodate large steamers. Greece possesses hundreds of islands, all of which produce the currant (a corruption of the word Corinth).

(5) **Constantinople** and a small area behind it are all that remain of the former vast European possessions of Turkey. *Constantinople* is built on both sides of the Golden Horn, an arm of the Bosphorus. It commands two great routes, the one from Asia to Europe and the other from the Mediterranean to the Black Sea. Scutari is that part of the city which lies on the Asiatic shores of the Bosphorus. A ferry service connects the Orient Express with the railway of South-West Asia.

EXERCISES

(1) What is the 'Meseta'? Why is it a poor pasture land?

(2) Why is most of the iron-ore of Spain exported?

(3) What are 'huertas'? Where are they? What is their economic importance?

(4) What natural advantages are there for the industrial development of Northern Italy?

(5) Why is the plain of Lombardy one of the most densely populated parts of Europe?

(6) "In Italy, every year thousands of people die of malaria." Why? Has the disafforestation of the Apennines anything to do with the formation of marshes along the coast?

(7) What is the strategic importance of Gibralter and Malta?

(8) Mention the economic importance of Rio Tinto, Almaden, Carrara, Palermo and Valladolid.

(9) How is the importance of Sophia, Constantinople and Milan due to their geographical position? Draw sketch maps to illustrate your answer.

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CHAPTER IX

THE SOUTH-WESTERN LANDS OF ASIA (Fig. 36)

South-west Asia is known as "the *Land of the Five Seas*," because five seas wash the shores of the lands comprising it. They are the Caspian, Black, Mediterranean, Red and Arabian Seas. This is a *region of plateaus and deserts.* The plateaus of Asia Minor in the north-west and that of Iran in the south-east, with the mountain ranges enclosing them, form part of the great belt of the Central Highlands of Asia. In the south-west lies the ancient crust block of Arabia separated from the Iran plateau by the only important lowland of Mesopotamia which is drained by the *Tigris* and the *Euphrates.* Refer to a good physical map. You have already learnt in connection with the climate of Eurasia, that a great deal of the plateaus of south-west Asia is dryland. Hence in some places there are true deserts, *e. g.*, the *Arabian* and the *Persian* deserts, and in other places the vegetation is scanty.

South-west Asia is made up of the following political units: (i) *Asia Minor* or *the Republic of Turkey;* (ii) *Palestine* and *Syria*, cared for by Britain and France respectively under mandates from the League of Nations; (iii) *Mesopotamia* or *Iraq* which was ruled under mandate by Britain until 1927, now independent; (iv) *Arabia*; (v) *Persia*; (vi) *Afghanistan*; (vii) *Baluchistan*, a part of the British Empire, and (viii) *Trans-Caucasia* and *Armenia.*

"The Land of the Five Seas" has always been a place of *historical importance.* In ancient times there were the great empires of Babylonia and Assyria in the Tigris-Euphrates valley. The ruins of Babylon, Nineveh, and Ur have now been uncovered. Palestine and Syria are lands of

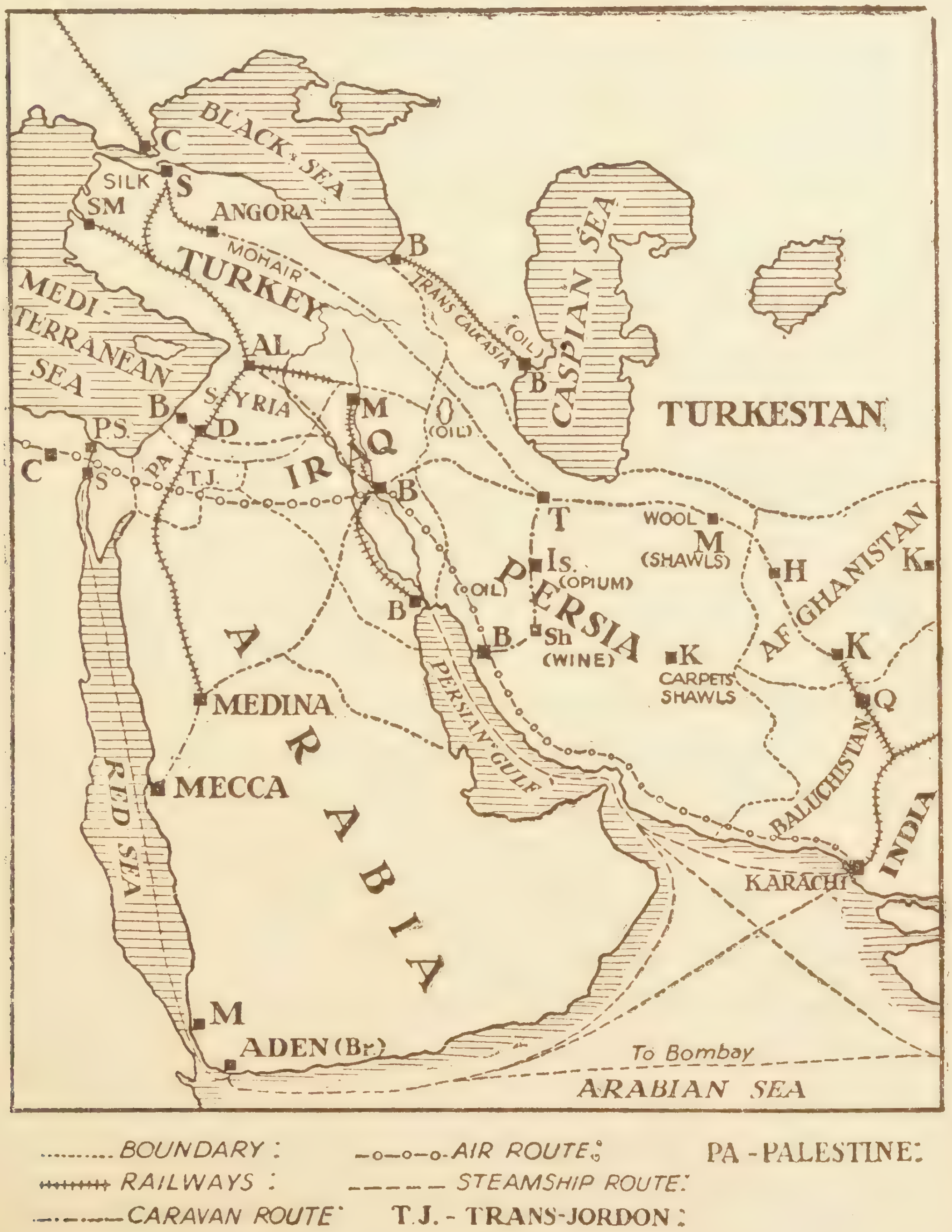

FIG. 36. SOUTH-WEST ASIA OR 'THE LAND OF THE FIVE SEAS.' Note that Bagdad is the meeting place of many routes.

the Bible. Mecca in Arabia was the birth place of Mohammed. The Persian empire extended over Babylonia and

Assyria and the Persians fought the Greeks and invaded Europe. Thus the 'Land of the Five Seas' was not only the seat of mighty empires, but also the birth-place of two of the greatest religions of the world, Christianity and Islam.

The present importance of South-West Asia lies in the fact that it lies between the busy manufacturing countries of Western Europe and the densely populated monsoon-lands of South-East Asia which grow raw materials needed for their manufactures. Hence all routes, by land, sea or air, between these two parts of Eurasia must pass across it. Hence South-West Asia is a land of *great routes.*

Figure 36 illustrates the chief routes across South-West Asia. The old routes were mainly *caravan* routes. There were three trade routes between Europe and the East. The central route was by sea as far as Basra on the Shat-el-Arab and thence by caravan to Bagdad, Damascus and the Mediterranean coast. The southern route was by the Red Sea, and as the canal connecting the Mediterranean and Red Sea was not then in existence, goods were taken by caravan to Alexandria *via* Cairo. The northern route traversed the plateau of Iran from Kabul *via* Herat, Meshed, Teheran, Tabriz, Erzerum to Trebizond on the Black Sea. Most of the caravan routes are used even today.

Railways have been constructed, of which the *Bagdad Railway* is the mort important. When finished this will form a railway route from Scutari across Asia Minor and Iraq to Baghdad and Basra. The gap in the line is now filled by a motor service. The *sea-route* from Europe to India and the Far East passes through the Suez Canal. The all-sea-route (*via* Gibralter) from England to India takes three weeks; the Overland-Mail Route (*via* France) takes two weeks. The air-route from Croydon (England) lies across Europe and the Mediterranean to Cairo. A more direct route *via* Cyprus and Haifa is also followed. From Cairo the route passes through Palestine and Syria to Baghdad. From here the route follows the northern shores of the Persian Gulf to Karachi in India whence passengers and mails can proceed by air to Calcutta and even to Singapore and Australia. In how many days does the air-mail from England reach India?

From the map (Fig. 36) you can see clearly that *Bagdad* is at the converging point of several routes: (i) by *air* from Cairo and Karachi; (ii) by *desert motor* from Damascus and Beirut; (iii) by *rail* from Basra; (iv) by *rail and motor* from Aleppo and Mosul; (v) by *caravan* from Teheren and from the Mediterranean, Black and Caspian Seas and the Persian Gulf; (vi) by *waterways* from north and south.

ASIA MINOR

The Mediterranean and Black Sea coastlands have a "Mediterranean type" of climate and are forested with evergreen trees. In the valleys and plains, in addition to the Mediterranean fruits (mulberries, olives, grapes, oranges and figs), tobacco, cotton, wheat and barley are grown.

Silk manufacturing is carried on at *Brusa*. Turkey is famous for its carpets and rugs. *Smyrna*, on a splendid harbour, is the chief port. Figs, tobacco and sponges are exported.

The plateau lacks moisture so that vegetation is of the Steppe type. Herds of camels, horses, sheep and goats are kept. *Angora* is the new capital of Turkey. It has long been famous for its fine goats' hair used in the manufacture of *mohair* cloths.

SYRIA AND PALESTINE

(2) **Syria and Palestine:** In Syria, olives, grapes, oranges and mulberries are largely cultivated near the coast.

In the dry east irrigation is necessary. Silk and tobacco are the special products of the Lebanon region. *Beirut* is the cheif port, connected by rail with *Damascus*, the capital of Syria. Damascus on an oasis is a route centre. The railway line going southward is "The Pilgrims' Railway" to Mecca.

The coastal plain of Palestine yields grain and fruits. The plateau of Judea has large flocks of sheep and goats. The Jordan valley and the Dead Sea lie in the Great Rift Valley. Industries have been started with the help of water power. In the Jewish colonies there are oil-works, soap-works and factories for the making of carpets, silk and other articles. *Jerusalem*, the city of sacred associations, is the capital of Palestine. It is visited every year by thousands of pilgrims.

(3) **Iraq:** This kingdom is watered by two large rivers, the Tigris and the Euphrates which unite to form the Shat-el-Arab flowing into the Persian Gulf. The southern portion of the plain is a lowland composed of alluvial deposits. Therefore the soil is very rich, but, as rainfall is very low, *agriculture* is not possible without irrigation. By the side of the rivers where irrigation is easy, cotton, wheat, tobacco and maize are grown. The northern portion of the country is undulating grassland, and pastoral work is more important than agriculture. The country can be much improved by constructing dams across the rivers as in Egypt. Large irrigation schemes are already in hand.

Bagdad, famous in the *Arabian Nights*, stands on the Tigris at the point where the river comes close to the Euphrates. How is this important? Its position as a route centre has already been referred to. *Mosul*, standing at the navigation limit of the Tigris, and at the intersection of the routes from the Black Sea to the Persian Gulf, and from the Mediterranean Sea to the Caspian, has *petroleum* wells. *Basra,* standing near the Shat-el-Arab, is the natural port of Mesopotamia and is reached by ocean vessels. The date palm receives special attention near the river so that large quantities of dates are exported from Basra.

ARABIA

This plateau which is tilted eastwards, is one of the driest lands in the world. The higher regions in the south-west and the *Nejd pleteau* in the centre receive slight rains ; elsewhere the land is practically rainless. But there are oases where *date palms* and *cereals* can be cultivated. The Nejd region is famous for its horses, camels, donkeys and sheep. The people who are largely Bedouin Arabs lead a nomadic life. In *Yemen* in the south-west, owing to the elevation, the climate is warm-temperate. Wheat and fruits are cultivated. *Coffee* is grown on the lower south-west slopes where the climate is hot and moist. This coffee is known as *Mocha* coffee. *Hodeida* is now the coffee port.

Mecca is famous as the birth place of Mohammed and every year it is visited by thousands of pilgrims. *Medina,* north of Mecca is also visited by pilgrims, and is reached by a railway from Aleppo and Damascus. *Aden* in the south-west, is a British possession. It is a strongly fortified naval and commercial depot on the great ocean trade route to India and the Far East. Its importance, like that of Gibralter, lies in its strategic position. The *Bahrein Islands,* in the Persian Gulf, are also British and have important *pearl fisheries.*

PERSIA

This is a shut-up plateau, and hence the climate is generally dry and extreme. The eastern half of the country consists of desert and scrub. On the plateau grasslands the peoples are nomads with their flocks of sheep and goats, asses and camels. Where there are rivers, the land is irrigated to grow fruit and grain. An elaborate system of underground canals is found near the plateau towns. Rice and tobacco are grown in some of these irrigated areas. Along the south coast date is found; and in the fertile lowlands bordering the Caspian Sea, silk, cotton and sugar are produced.

Persia is famous for its beautiful *carpets* made at *Tabriz*, *Meshed* and other places. Most of the Persian trade is carried on by caravan, mules being largely used. *Teheran* (the capital), *Ispahan* and *Shiraz* are caravan centres. *Bushire* is the chief port of Persia on the Persian Gulf. Teheran is a focus of trade routes and has motor service connection with Damascus and Beirut.

Valuable *petroleum* deposits have been found in the Karun valley, and these are worked by The Anglo-Persian Oil Company. *Ahwaz* is the chief centre from which petroleum is sent to Abadan, an oil-refining port on the Shat-el-Arab. *Mohammerah* is the port from which the oil is sent in tank-steamers to Western Europe.

AFGHANISTAN

This lies in the north-east of the Iran plateau and has a very rugged surface. In the south-west is the *Seistan* depression which contains salt marshes into which the *Helmand* and other streams lose themselves. The upland pastures are suitable for grazing flocks of sheep, goats, asses and camels. Here the people are nomads. As the rainfall is scanty, cultivation is carried on with the help of irrigation. Wheat, barley, rice, maize, tobacco, and large quantities of grapes, figs, peaches and other fruits are grown. *Kabul*, the capital of Afghanistan, is a town of strategic importance as it controls the Khaibar Pass. Fruits, silk, carpets and wool are sent down the pass to Peshawar in India. *Kandahar* in the South and *Herat* in the west are other important towns. Afghanistan forms a *buffer* state between Russian and British territory.

ARMENIA, GEORGIA AND AZERBAIJAN

All these are republics belonging to the Russian Union. Armenia is a small state east of Turkey, with pastoral and agricultural work. *Erivan* is the capital. The other two states form Trans-Caucasia. In the valleys of these states, tobacco, cotton, and maize, as well as the vine are grown.

Baku, on the Caspian Sea, the port and capital of Azerbaijan, is the centre of an important petroleum area. As the town stands on an enclosed sea, it is connected by a pipe-line with *Batum* on the Black Sea. From here the oil is shipped to all parts of Europe. *Tiflis*, the capital of Georgia, stands on the Kur at the point where the route across the Dariel Gorge in the Caucasus opens out into the valley.

EXERCISES

(1) Why is south-west Asia called the 'Land of the Five Seas'?

(2) Why is this region important to-day?

(3) Why are the following towns important: Aden, Bagdad, Damascus, Jerusalem and Mecca? Draw a sketch map to show the position of Bagdad.

(4) Draw a map of south-west Asia and mark therein, the Bagdad line, the Air-route from Egypt to India and Suez Canal Sea-route.

(5) Mention the chief areas in South-west Asia where petroleum is obtained. What is the disadvantage of the position of Baku? How is this remedied?

CHAPTER X

CENTRAL AND NORTHERN EURASIA

This includes the kingdom of *Rumania* and the *Union of Soviet Socialist Republics.* This union was formed in 1922 by the federation of the Soviet republics of (1) The *Ukraine* ; (2) *White Russia* ; (3) The *Russian Socialist Federal Soviet Republic* (R.S.F.S.R.) ; and (4) The *Trans-Caucasian Federation.* The last named has been dealt with under South-Western Asia. The Russian Socialist Federal Soviet Republic includes the whole of Siberia, Central Asia (Turkestan) and European Russia (what remains of old Russia after Finland, the New Baltic Republics, Poland, Ukraine and White Russia have been taken out).

The whole region falls into four natural regions (Fig. 37): (1) the *Tundra* ; (2) the *Forest belt* ; (3) the *Black Earth* and *fertile Steppe region* ; (4) the *Salt Steppes* around the Caspian Sea and the *semi-desert* and *desert lands of Turan.*

(1) **The Tundra :** This region roughly lies north of the 65th parallel of latitude. You have already learned that in this region the smmmers are short and warm, the winters long and cold, the rainfall is scanty, and that as a result of these conditions only mosses, lichens and small berry-bearing plants are found. For the greater part of the year the ground is covered with ice and snow ; when these melt in the early summer, much of the region is flooded. Millions of mosquitoes make life in these swampy lowlands almost unbearable.

The inhabitants of the tundra belong to the Mongolian race, and are known by different names—the *Lapps* and *Finns* in Northern Norway and Russia, and the *Ostyaks*, *Samoyads* and *Yakuts* in Northern Asia. The tundra provides, nothing for the support of human life, but the vegetation there is able to support herds of reindeer.

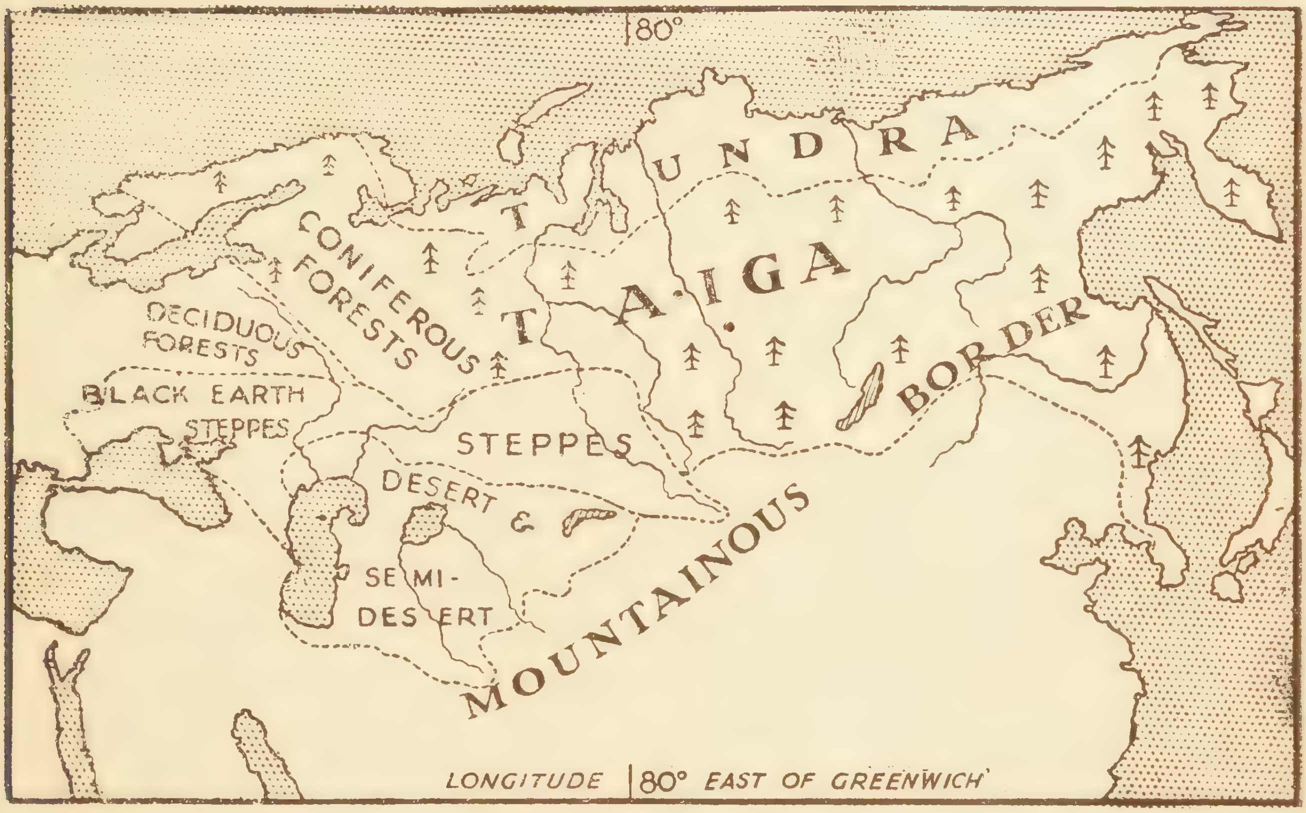

FIG. 37. CENTRAL AND NORTHERN EURASIA: Natural Regions.

Hence the inhabitants of the tundra have to depend for their food upon the reindeer. They can catch some fish in the rivers and sea, and can hunt some animals in the forest border. The reindeer roam about in search of reindeer moss and hence their owners have to follow them from place to place. The wealth of a family consists in the number of reindeer it owns. The reindeer, which has broad spreading feet like the camel, is able to drag loads over the frozen snow. When alive, it provides milk; when killed, every part of its body is useful: the skin is used for clothing and tent covers, the flesh for food, the horns and bones for tools, and the sinews for thread.

Fishing is carried on chiefly in the late spring and summer. Why? The men catch the fish, and the women dry enough of them for use in the long winter. Tusks of mammoths that are found buried in the ice of past ages, with furs and skins are used for barter with traders for tea, tobacco and spirits.

Fishing in streams, hunting near the forest edges and keeping reindeer herds make the tundra dwellers live nomadic or wandering lives; hence their houses are tents which are easily carried, erected or pulled down. But the winter dwelling is of a more permanent type than the summer one.

As life in the tundra is precarious, the people there have no pity for those who cannot support themselves. The aged, the sick and the weak and superfluous children are sometimes neglected and left to perish.

In the lower basin of the *Dwina*, the inhabitants are engaged in preparing oils (from the blubber of the seal), tar, pitch and timber (from the forests); and in trading in furs and skins. The centre of this trade is *Archangel* which is ice-free only in the summer months.

(2) **The Forest Belt:** This region lies south of the tundra and stretches across the continent from the Baltic Sea to the Pacific Ocean. The trees are mainly conifers, but in the south-west and southern margins many broad-leaved trees are found. The trees grow very slowly for they have little heat and rain. *Transpiration* through the needle-shaped leaves is slight so that the trees do not suffer when the water supply is scanty. In the south and south-west of the belt in Europe, vast areas have been cleared, and agricultural and other occupations are carried on. Rye, oats and root-crops are the chief cultivations.

The north-eastern portion of the forest belt in Europe and the whole of the Siberian forest (known as the taiga) are still in a state of virgin forest, where trapping and hunting the animals are the chief occupations. The trapping in a taiga is done chiefly by Ostyak and Samoyad hunters who live on the northern fringes. Their settlements are regularly visited by traders.

But lumbering and forestry trades, such as the extraction of tar, pitch and resin, pulping and paper-making, have not been so well developed as in Canada. This is due to the poor means of communication and transport. It would be too costly to send the timber long distances by railway to Europe or the Pacific Coast. Canada has its network of rivers and lakes by which timber and wood-pulp can be cheaply moved to ports and cities, but the three great rivers flowing through Siberia (the Ob, Yenesei and Lena) lead northward to a frozen sea and not to regions where the timber is needed. The Amur is the only stream which is used for timber transport. Better means of communication in future may lead to the developement of lumbering.

Two coalfields are situated in this region. The first lies south and south-west of Moscow. As the coal here is of inferior quality, the industrial centres have to get much of their supplies from the *Donetz* coalfield. *Moscow*, the largest city of Russia and the present capital, has important cotton, wool, leather and china industries, and is also the chief engineering centre in the country. Its central position has made it the "hub" of the Russian railway system. *Tula*, south of Moscow, has large iron and steel works. The second coalfield lies on both sides of the Urals in the dis-rict which is rich in other minerals, such as iron, gold, copper, platinum and precious stones. *Perm* and *Ekaterinburg* have growing iron and steel trades.

Another inland town which deserves mention is *Nishni-Novgorod* at the junction of the Oka and the Volga. It is the old meeting-place of east and west. It is famous for the great annual fair held from July to September. In normal times merchants from China, Siberia, Persia, Trans-Caucasia, the Steppes, the Black Earth Region, and from Western Russia and the Baltic Republics bring their commodities for sale and exchange.

At the head of the Gulf of Finland stands the important city and port of *Leningrad.* This was known as Petrograd as it was established by Peter the Great. It is built at the mouth of the Neva and is protected on the seaward side by the fortress of Kronstadt, built on an island. It is the only Russian sea port on the Baltic Sea, but it is no longer the capital, and has lost much of the importance which it possessed before the Great War.

(3) **The Black Earth Lands and Fertile Steppes:** The Black Earth Lands extend from the plain of Rumania through Ukraine to the middle Volga and further east into Siberia. Here the natural richness of the soil has been increased by dark-coloured accumulations of vegetable material from the natural grasses which grew up and died down each year through many centuries. The climate and soil of this region are ideal for the growth of *wheat.* Near the shores of the Black Sea, the soil is not so rich as the black earth, and as the climate is drier, this is poorer grassland, and is known as the Steppe region.

The Kingdom of Rumania is now twice its pre-war size, and has a population of 18 millions. Its plains are really a 'tongue' of the Russian plain and form rich agricultural lands yielding valuable crops of *wheat* and *maize* as well as *vines* and *tobacco.* Maize is used largely for home use, as food for people, animals or poultry ; it is grown by the small land-owners. Wheat is in the main an export crop, and is grown by the large land-owners. Barley and oats are also grown, but to a lesser extent than maize and wheat. Animals of all kinds are kept throughout the country. *Bucharest*, the capital, has a central position in the Wallachian plain. *Galatz* and *Braila* are important river ports at the delta head of the Danube. North-west of Bucharest along the foothills of the Carpathians are rich deposits of *salt* and *petroleum*. The Carpathian forests support large numbers of pigs and supply timber to the treeless plains.

The Ukraine (=Borderland) is the greatest agricultural region of Eastern Europe. The area of this region is about that of Great Britain and its population is about 35 millions. Before the Great War, Britain and other Western European cuntries imported large quantities of Ukrainian wheat. This was grown on the large estates of the great nobles. Now that the land has been parcelled out among the peasants, more attention is paid to producing articles for home consumption. Rye, oats, barley and maize are the chief products. Flax, hemp, beet and tobacco are also grown. Towards the east and along the margins of the Black Sea, the rearing of horses, cattle and sheep becomes more important than agriculture.

The Ukraine contains the western part of the most important Russian *coalfield*. It lies in the *valley of the Donetz*, a tributary of the Don. All kinds of coal are found as well as an abundance of iron. Much coal is exported to Moscow and Leningrad.

Odessa, on the Black Sea near the mouth of the Dniester, is the great outlet for most of the products of the Black Earth Lands. It has the advantage of being usually open in the winter. *Kiev*, the largest town in the interior, is a very ancient city and was once the capital of old Russia. As it was exposed to the attacks of Mongol invaders, the capital was transferred to Moscow. Kiev has important industries such as flour-milling, sugar-refining and tobacco and woollen manufacturing. *Kharkov*, the Ukrainian capital, is, like Kiev, an important trading centre, where great fairs are held at which traders from all parts of the Ukraine and southern Russia sell and exchange their wares.

Saratov and *Samara*, the chief centres of the eastern Black Earth Land, are important river ports on the Volga. They are also tobacco and woollen manufacturing centres.

The Siberian Steppe Land : This is a continuation of the Black Earth and Fertile Steppe Lands of Europe, and extends as far east as the Irtish. The climate is extreme, and rainfall is small and falls mostly in summer. The appearance of the steppes changes with the seasons. In winter they are white with snow. In spring they are beautiful carpets of flowers. In early summer when the grass grows the steppes are vast expanses of green ; in autumn the grass withers and the steppes become brown.

The northern portion of the steppe is arable land and is being rapidly developed. The Trans-Siberian and Trans-Caspian Railways have greatly helped the settlers from Russia to carry on their work. Improved farming with modern machinery, wells and irrigation are producing great crops of wheat, oats, rye and root-crops. The modern settlers in this part of the steppe live a settled life. Cattle are reared in large numbers, and the manufacture of butter, introduced by the Danes, is one of the chief industries in Siberia. About 50 to 100 miles on either side of the Trans-Siberian Railway, the grass land is occupied by Russian peasants who cultivate the land and export some wheat and large quantities of butter together with meat, hides and wool.

Further south the soil is poorer and the rainfall, less. Only grasses grow except in irrigated areas where wheat, rice, flax and cotton are grown. The majority of the inhabitants of the southern part of the steppe are shepherds who rear large herds of cattle, sheep, goats, horses and camels. The chief tribes of this area are the *Kirghiz*, and hence the name *Kirghiz Steppe.* As the grass in a particular place is soon exhuasted, the animals have to be constantly moved from place to place. Thus the steppe people lead a nomadic life ; hence they live in tents of light lattice work covered with skins. These tents are usually round in shape, and they can be closed in storm and opened in sunshine. They are well furnished with rugs, cushions, carpets, leather bags etc., and are therefore a great deal better than those of the people of the tundra ; the work of erecting or taking down the tent is done by women.

In winter the people live in fixed houses or tents in places where there is spare grass or hay and where there is a reliable water supply. Their food is meat, butter, cheese and milk, and their favourite drink is a kind of fermented milk (koomiss). Caravans supply them with tea, tobacco and spirits. The steppe people carry on important home industries, making camel's-hair cloth, carpets and rugs, and hair cushions. As the flocks and herds are of vast size, good horsemen are required to choose halting places or to prevent flocks from straying from the line of march. Hence wealth of a family is measured by the number of horses it owns. The steppe dwellers are good horsemen ; the Kirghiz call themselves *Kazak*, *i.e.*, horsemen, hence the Cossacks (who form the famous Russian cavalry).

To tend, water and milk thousands of animals many persons are needed ; hence the families are very large. The wealthy steppe dwellers have more than one wife, and the joint family system prevails, the head of the family being obeyed by all. As there is more food supply in the steppe than in the tundra, there is no infanticide or inhumanity to the aged and the sick. A rich man may be suddenly reduced to poverty owing to loss of his wealth (*i.e.* animals) through drought, cold or disease.

The Trans-Siberian Railway: Fig. 38 shows the great *Trans-Siberian Railway.* It is the longest trans-continental route in the world, the distance between Moscow and Vladivostok being nearly 5390 miles. The journey takes about 16 days. From Leningrad the line passes through Moscow and Samara, and after crossing the Urals at Chelyabinsk it enters the steppe of south-western Siberia. It crosses the Irtish, an important tributary of the Ob, at *Omsk.* This is the largest city (136,000) in Siberia, and a centre for grain, timber and dairy produce. North-west of Omsk, at the junction of the Irtish and Tobol is *Tobolsk.* From Omsk the railway continues east-wards, sending a branch line to *Tomsk* (118,000), the university city with flour-mills, timber-yards and distilleries, and also the centre of a gold-mining district. For some 300 miles the line passes through coniferous forests and crosses the Yenisei at *Krasnoyarsk*, a market centre and a mining town. Thence the line goes on through open country to *Irkutsk* (130,000) to the west of Lake Baikal, the capital of Eastern Siberia. After passing round the southern end of the lake, the T. S. R. divides into two branches, one branch following the general direction of the Amur and the other continuing across Manchuria *via Harbin* to *Vladivostok.* At Harbin a branch is sent off southwards to Port Arthur and Pekin. The Amur valley line gives a route to Vladivostok entirely through Russian territory. *Vladivostok* (100,000) has a fine harbour on the

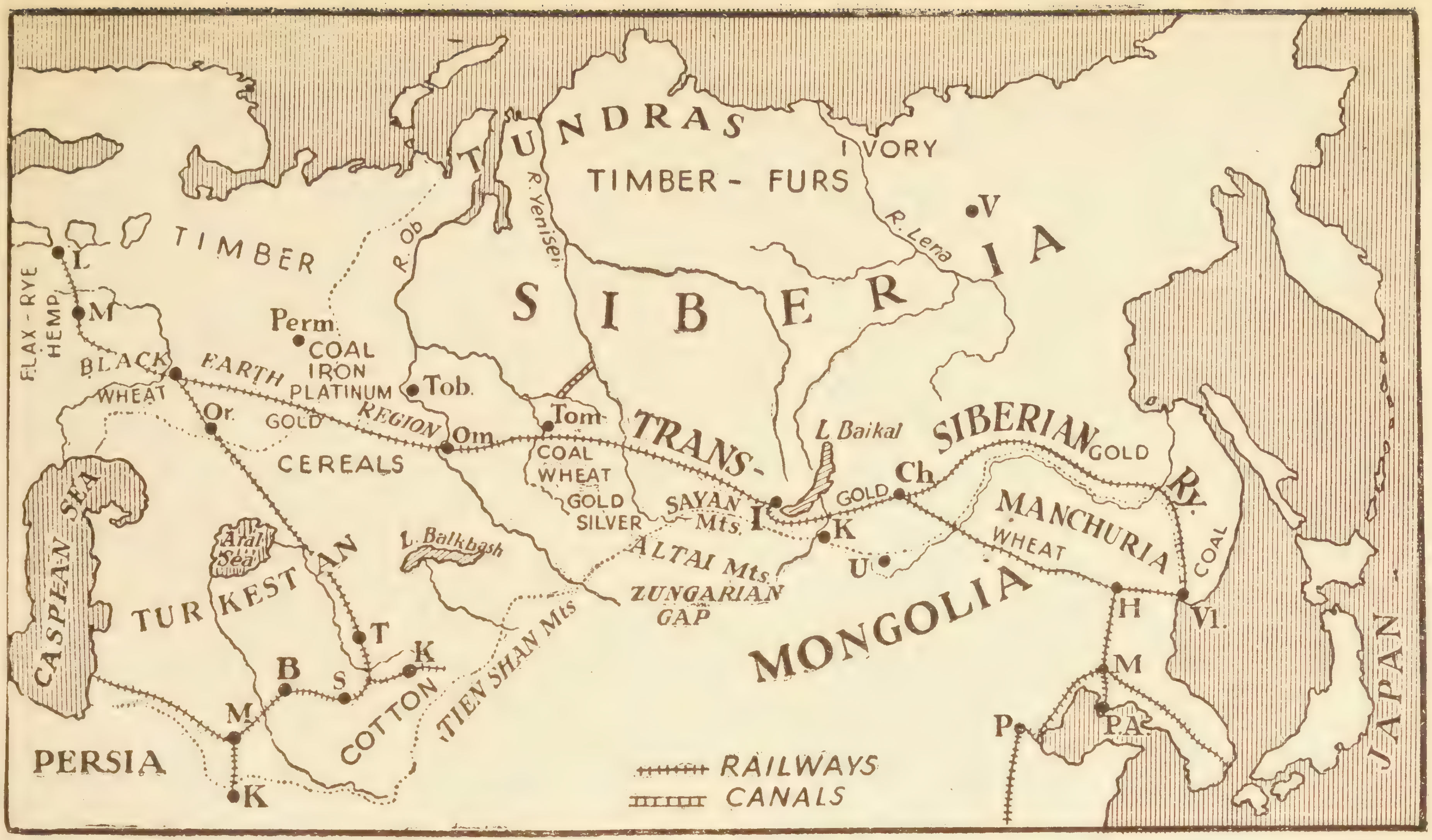

FIG. 38. CENTRAL AND NORTHERN EURASIA: Economic Map, showing Trans-Siberian and Trans-Caspian Railways.

Sea of Japan. It is the sea-outlet for the T. S. R., and exports the timber of the forest belt and soya beans from Manchuria. Large quantities of tea and silk from China and Japan, and manufactured goods shipped across the Pacific from the United States are sent by the T. S. R. across Siberia to Europe. But the harbour of Vladivostok is blocked with ice for several weeks in winter.

The immediate result of the building of the T. S. R. was that "civilization flowed like a broad stream behind it from the Urals to the Pacific." Its construction gave an enormous impetus to Russian immigration into Siberia. The line is now being relaid and doubled. It was begun in 1891 and was completed in 1904.

The salt steppes and desert and semi-desert lands: This region lies between the Caspian Sea on the west and the central highlands in the east and stretches southwards to the Iran plateau. Much of the land lies below 600 feet, and some of it around the Caspian border is actually below sea level. Here there are extensive salt marshes. The climate is of the extreme dry type, with severe winters and hot dry summers.

Near the Caspian Sea true desert occurs, but towards the Black Earth region there are grasslands which support nomadic pastoral tribes like the Kalmucks of the lower Volga. The most important town in this region is *Astrakan* at the mouth of the Volga. It has an extensive trade in wool and tallow, and distributes by rail the petroleum brought by steamer from Baku. Its harbour is frozen for about three months every year, and the Caspian Sea has no outlet to the open sea.

The important drainage centre of *Turkestan* is the Sea of Aral into which flow the Syr Daria and the Amu Daria. These streams are supplied with water because they rise in mountains which receive rain and are often covered with snow. There are other streams which lose themselves in the sand. It is only along the banks of these rivers that fertile tracts are to be found in which agriculture and stock-rearing are possible. Away from the rivers there is desert. In the irrigated regions of the river valleys settled life is possible, and *wheat*, *barley*, *maize*, *tobacco* and *fruits* of the Mediterranean type are produced. *Cotton*, *rice* and *mulberry* are grown in fertile Ferghana and the valley of the Zarafshan.

Over the poor grasslands are kept great flocks of sheep, herds of cattle and droves of horses, asses and camels ; here the people are nomads. Hides, hair and wool are important products ; carpets and rugs of wool and silk are articles of trade.

Figure 38 shows the *Trans-Caspian Railway* which leaves the Trans-Siberian line at Samara and crosses the Ural river at Orenburg. From here the line reaches the valley of the Syr and continues to *Tashkent* (160,000) the capital of Ferghana, "the chief cotton republic." Leaving Tashkent the line reaches *Samarkand* (once the capital of Tamerlane) and *Bokhara*. The republic of Bokhara is watered by the Amu and the Zarafshan. Wheat, fruits, silk, tobacco, cotton and hemp are the chief products. Gold, silver, alum and sulphur are mined. From Bokhara, the railway turns south-westwards and goes to *Merv* from where a branch runs south to *Kushk*, on the border of Afghanistan. Leaving Merv the main line runs westwards to its terminus at Krasnovodsk, on the Caspian Sea. This railway is important as a highway of trade between Europe and Central Asia.

Only a few miles of difficult mountain region lies between Russia's last annexation (the Pamirs) and British

India. When Russia brought her railway up to the frontier of Afghanistan, it was thought that she did it with a view to extend her empire in the direction of Persia and Afghanistan, and through the latter to threaten India.

Siberia is about 5 million square miles in area and has a population of over 11 millions. The peopling of modern Siberia was due chiefly to the migration of the Cossacks and the exile of political and criminal prisoners. With the great railway came settlers, workers and traders, and the development of the railway belt (about 100 miles wide) has been rapid. Irrigation schemes and new and better farm methods are bringing the steppe into cultivation. Everywhere nomad life is weakening into settled life. With her vast forests as well as agricultural and pastoral lands and with her enormous mineral wealth in the eastern highlands, Siberia has a very prosperous future.

EXERCISES

(1) Give an account of the close connection between the physical conditions and the modes of living of the peoples of the tundra and the steppe.

(2) What factors have led to the growth and importance of Moscow, Omsk, Samarkand and Vladivostok ?

(3) Why are the forests of Siberia not fully developed ?

(4) Compare and contrast Siberia with the Dominion of Canada.

(5) In which natural region does the Ukraine lie ? What is the fertility of the land due to ? Why does the country not export large quantities of wheat as it once did ?

(6) Trace the course of the Trans-Siberian Railway, stating its importance to the development of Siberia.

(7) "The Russian Lands occupy about one-third of Asia, but their population is only about one-fortieth of that of the continent." Explain the reasons for this.

(8) Which part of Northern Eurasia may be described as the "land of hunger and privation"? Why?

(9) Mention the chief coalfields of Russia in Europe. Which has the best coal? Which has the chief industrial centres? Whence do these centres get the raw material for their textile industries?

(10) Before the T. S. R. was taken round the southern edge of Lake Baikal, how could people have crossed the lake in summer and in winter?

CHAPTER XI

CHINA AND HER DEPENDENCIES

The Chinese Republic (founded Feb. 12, 1912) consists of : (1) *China proper* (18 provinces), (2) *Manchuria*, (3) *Sin-Kiang* and (4) *Tibet*. Since 1912 there has been great unrest and much fighting and war among rival factions. Now the central government established at Nanking is trying to enforce its authority over the whole country. *Mongolia*, once a dependency of the Chinese Republic, is now (since 1924) a protectorate of the Russian Socialist Federal Soviet Republic.

According to a recent estimate China including Mongolia has a total area of more than 4 million square miles, and a population of about 320 millions. China proper alone contains more than 300 million inhabitants. The bulk of the Chinese people live in the lowlands of the east (Fig. 2 : Relief of Asia) where agriculture is carried on on a large scale on account of the fertile river basins and the monsoon type of climate. In the plateaus and highlands the population is necessarily scanty.

CHINA PROPER

China proper falls into three natural regions : (1) *Northern China* or *the basin of the Hwang-ho and Pei-ho*; (2) *Central China* or *the basin of the Yangtse*; (3) *Southern China* or *the basin of the Si-kiang*. You have already learnt that owing to differences of temperature these three regions have temperate, sub-tropical and tropical types of monsoon climate respectively. The summers are

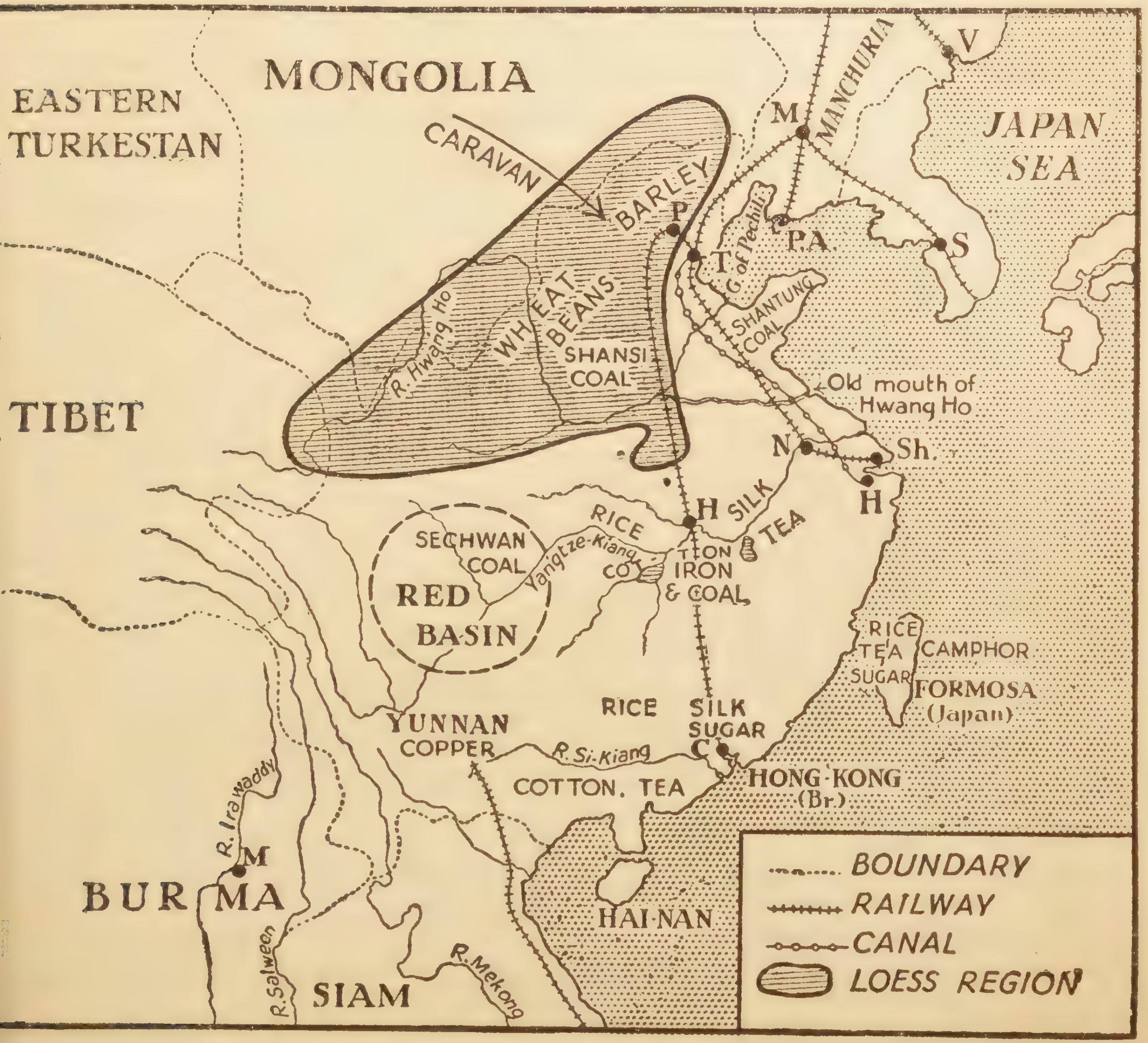

FIG. 39. CHINA: Economic.

hot throughout, but in winter the south is warm, the centre is cool and the north is cold. Rainfall is very heavy in the south, but decreases in amount northwards, *e. g.*, Hong-kong has an annual rainfall of 85 inches, but Tientsin has only 18 inches.

China is by nature an *agricultural country*. Farming of one kind or another is the occupation of two-thirds of the people. Hill sides are terraced, irrigated and cultivated from top to bottom. In recent years the establishment of schools of agriculture and experimental farms is doing much towards scientific agriculture. In the south of China three crops can be raised, in the Yangtse valley two, but in the north only one is possible.

The chief farm animals are buffaloes and oxen. Pigs and poultry are reared everywhere. Eggs, egg-yolk and pigs' bristles form important articles of export.

Northern China is mountainous in the west and low in the east. A large part of it is covered by a deposit of yellow soil, called *loess.* (Fig. 39) This is the loose dry surface soil of the arid plateaus to the west which has been brought by the dry winter monsoon blowing outwards from the heart of Asia. This fertile yellow dust has in course of time accumulated over the plains, hills and valleys of Northern China to an enormous depth. (1000 ft.) The soil is so soft that the Hwang-ho and other rivers have cut deep valleys in it making communication difficult and irrigation impossible. Yet it is at the same time so firm that large masses of it stand in perpendicular walls, hundreds of feet high. The one great drawback of the loess is its highly porous nature.

You have already learnt that the Hwang-ho is not of great commercial value as it is too swift for navigation and often shifts its bed in its lower course. But the alluvial lands round the Gulf of Chili formed of sediment carried down by the river are of great value to agriculture.

The chief crops are wheat, barley, beans, millets and to some extent tobacco and cotton. Rice is not grown north of the Tsingling which forms a boundary between the Wei-ho and the Yangtse.

The most important city in this area is *Peking* (1,300,000) which was the Chinese capital till recently. Its position is of great strategic importance; for it controls the route to Manchuria along the coastal plain and also the route to Mongolia *via* the Pei-ho and Kalgan. The city was captured by the Manchus in the 17th century, and it was the centre of Manchu power until the Revolution in 1912. It consists of two parts, the Manchu city within four walls each three miles long, and the Chinese city, rectangular in shape and attached to the south wall of the Manchu city. Peking is now connected by railway with Mukden in Manchuria, with Kalgan in the north-west, with Tientsin, its port, and with Hankow on the Yangtse. (Fig. 39) The Peking-Hankow line will eventually link up with the line running north-west from Canton. The railway from Peking to Kalgan will shortly follow the caravan route from Kalgan *via* Urga to Kiakhta and link up with the main line of the Trans-Siberian Railway. This will bring Peking within 10 days' journey of London.

Tientsin, the port of Peking, stands on the Pei-ho river. It is the northern terminus of the Grand or Imperial canal which is nearly 1,000 miles in length. It gave a water connection between Tientsin and Hangchow, but of late years it has been much neglected. Tientsin cannot be reached by large steamers and the river freezes in winter for three months.

From the Gulf of Chili runs westward for 1,600 miles the *Great Wall of China*, one of the wonders of the world. It was built to keep out invaders from the north-west and was completed about 205 B.C. It is from 25 to 30 feet high, and 15 to 30 feet thick with turrets at intervals.

Central China comprises the basin of the Yangtse-kiang. The lowlands lie along the river and near its mouth. The temperature is higher, and rainfall heavier than in Northern China. The mild winter and evenly distributed rainfall make it possible to raise two food crops in a year. The richest part of the Yangtse valley is the Red Basin (Fig. 39) of Szechwan which is as big as France and contains one-seventh of the total population of China. The Red Basin is so called because of its fertile red soil which is derived from the weathering of the red sandstone of which the area is composed. There are numerous irrigation canals in the basin. The characteristic products of the Yangtse Basin are rice, tea, sugar, cotton, beans and silk. In the Red Basin, sugar, maize, beans and rice are grown in the lowlands, and wheat, mulberries, opium and drugs (rhubarb) on the slopes. Szechwan is called " the granary of China ".

Rice grows everywhere in the lowlands in the middle and lower valley of the Yangtse, and still, owing to the dense population considerable quantities of rice are imported from Indo-China. Rice straw is used for making hats and mats. The best China *tea* is grown on the southern slopes of the Yangtse valley. The chief outlets are Hankow and Foo-chow. China tea has suffered from competition of teas from India and Ceylon. The cultivation of *mulberry* and the winding of *silk* are household industries. China produces at least one-fourth of the world's total silk supply, and is second only to Japan. Silk is prepared on a commercial scale at Tientsin, Shanghai, Hankow, Canton and other large towns. Large quantities of *cotton* are grown in the Yangtse valley, and raw cotton is exported to Japan. There are cotton mills at Shanghai, Hankow, Wuchang and Canton. At present large quantities of cotton piece goods and cotton yarn are imported from India and Japan.

You have already learnt that the Yangtse is navigable below Ichang for river boats and small ocean vessels to Hankow, and from that city to the mouth for larger ocean vessels. In the middle course of the river there are lakes which, when the river is in floods, act as great reservoirs, and thus help to check disastrous floods. In the dry season when the river is low, the lakes help to increase its volume. In spite of these lakes there have been disastrous floods very recently.

The chief town of the Red Basin is *Chengtu* (550,000) where several routes converge. It has a university. At the confluence of the Han and the Yangtse stands the triple city of *Hankow—Wuchang—Hanyang*, "the commercial heart of China". Hankow, the second largest city in China, has silk and cotton mills and smelting works. Hanyang has up-to-date steel works utilizing local coal and iron. Considerable quantities of pig-iron are exported to Japan and even to the United States. *Nanking* (380,200), on the lower Yangtse in the midst of a fertile alluvial plain was long ago the capital of China. Its central position, almost equidistant from Peking and Canton, has once more made it the capital of the whole country since 1927. It is connected by rail with Tientsin and Shanghai. *Shanghai* (1,500,000), the natural outlet for the whole of the Yangtse valley, stands south of the river delta. Its harbour is in constant danger of silting up, and, therefore, has to be continuously dredged. The city has cotton mills, silk factories, and shipbuilding yards.

Southern China is mountainous except in the valleys of the rivers, the chief of which is the Si-kiang (West River). The valleys of the right hand tributaries of the Yangtse form the routes between the two river basins. The mountains of South China are densely forested on account of the heavy rainfall. The forests supply valuable products such as bamboo, camphor and cinnamon. The bamboo is used for all sorts of purposes. The tender shoots provide a vegetable ; the stouter stems provide building materials and are used in the making of household utensils and numerous other articles. In the lowlands of the Si-kiang and in the coastal regions rice, tea, sugar, oil-seeds, maize, cotton, silk, indigo and fruits are cultivated. Agriculture can be carried on all the year round, and three crops can be raised on the same ground in one year.

The largest city is *Canton* (900,000), the natural outlet for the Si-kiang valley. It stands at the head of the delta made by the three rivers, the Pei-kiang (North river), the Si-kiang (West river) and the Tung-kiang (East river). Nearly one-third of the inhabitants live in boats floating on the river. Canton commands the routes to the west, north-west and south, and has steel and cotton manufactures.

Near the estuary of the three rivers above mentioned is the island of *Hong-Kong* which together with the peninsula of Kowloon has been British since 1841. *Victoria*, the chief town and port, has a splendid harbour. It is the "doorstep" of China. Through it pass Chinese products to Britain and Western Europe, and manufactures of the West to the markets of the Far East. Hence it has a large *entrepot* trade like Shanghai and Singapore.

The province of Yunnan in the west is a high plateau and is used for the pasturing of cattle and sheep. It is also rich in all kinds of minerals. It is connected with the French port of Hanoi by a railway.

Fig. 40 shows the *mineral wealth* of China. China's vast mineral resources have been little developed owing to bad transport and lack of enterprise. Something is being done by Japanese and European capitalists to open up mines and build factories. China's vast resources of coal and iron with her dense and hardworking population will enable her in a few years to take her place among the leading industrial countries of the world.

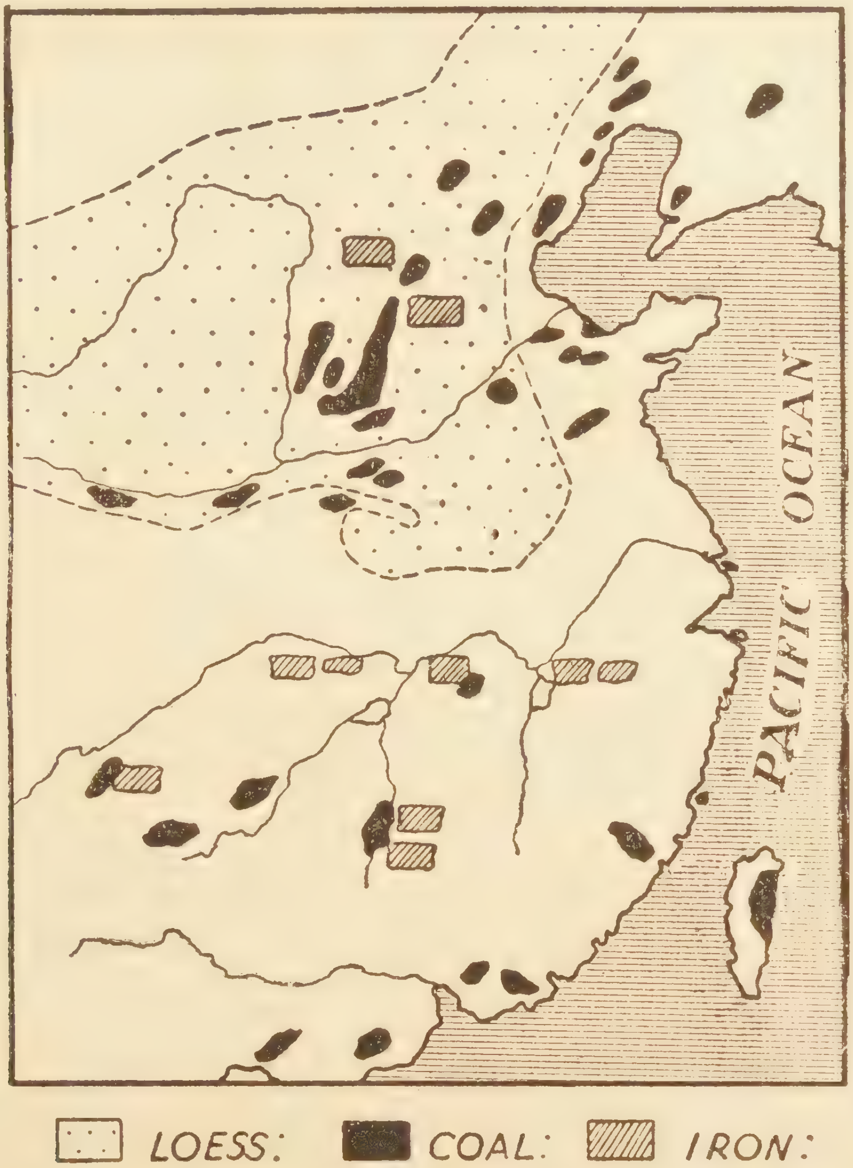

FIG. 40. CHINA: Coal and Iron deposits.

The chief *coalfields* are: (1) *Shansi*, the largest anthracite field in the world; (2) *Shantung*; (3) in *Hupeh* which supplies the iron and steel plants of Hanyang and Hankow, (4) on *the borders of Szechwan and Yunnan*; (5) near *Mukden in South Manchuria.*

The chief *iron* mines are at Tayeh in Hupeh. These mines supply the Hankow iron works and export large quantities to Japan. Yunnan, Shansi and Szechwan have also iron deposits. *Copper* is found near Lang-chow, in Yunnan and in Szechwan. *Tin* occurs in the Mengtsze district in Yunnan, and is sent by rail and ship to Hongkong to be smelted there. *Kaolin* (China clay) has given rise to the pottery industries of Fukien, Kiangsi, and Kwantung.

MANCHURIA

Manchuria is the smallest of the Chinese dependencies, but the most important. It has lowlands in the west and mountains in the east. The summers are warm and the winters cold. The summer monsoon deposits most of its moisture on the seaward slopes of the mountains, so that the plain of Manchuria is covered with steppe-like vegetation like the prairies of North America. The Chinese have extensively colonized Manchuria and are recognizing its possibilities as one of the richest agricultural countries in the world.

The rich soil of Manchuria produces *wheat*, *millet*, *maize*, *hemp* and the *soya bean*. The millet and soya bean are the staple food of the people. The wheat is exported to Japan and Siberia. Large flour mills have been established in many of the big towns which produce "over 5,000,000 sacks of flour annually." Sugar-beet is also grown near Mukden and Harbin. From the soya bean are prepared various kinds of food for human beings, fodder for animals, oils for lighting, cooking and lubrication and also for making soap, paper for various purposes, and an excellent manure for the fields. From *Newchwang* on the Gulf of Liaotung large quantities are exported to Japan. Oil mills can be seen in every considerable town in the bean-growing areas : *e.g.*, Mukden, Dairen.

Manchuria has an important source of wealth in her *forests*. In the north and north-west are dense forests of coniferous and broad-leaved trees. The biggest lumbering industry is along the upper Yalu. *Harbin* is an important timber market. *Silkworms* are reared on small oak trees for the production of tussore silk.

Stock-rearing is much more common in Manchuria than in China proper. Horses, cattle, mules, sheep and pigs are raised in large numbers. Manchuria is rich in *minerals* but little of which has hitherto been utilised. Coal, iron, gold, silver, lead and asbestos are found.

The largest town and capital of Manchuria is *Mukden* (158,000) at the junction of the Manchurian, Chinese and Korean Railways. It has flour mills and oil factories. Its port is *Newchwang* which exports the soya bean, silk, grain and ginseng (a medicinal root) and imports cotton goods, machinery, petroleum and sugar. Four lines branch off from Mukden. (Fig. 39) One goes south-west-wards to Tientsin and Peking; another southwards to Newchwang and then along the Liao-tung Peninsula to Port Arthur and the new port of Dairen; a third runs south-eastwards to Korea, and the fourth passes north-eastwards to *Harbin* where the Trans-Siberian Railway crosses the Sungari on its way to Vladivostok. Since the Russo-Japanese war (1905) Port Arthur has belonged to Japan. Port Arthur and Dairen are ice-free ports.

The present prosperity of Manchuria is due to the friendly co-operation of the Chinese, Russians and Japanese.

SIN-KIANG

Sin-Kiang or the "New Dominion" is often spoken of as Chinese or Eastern Turkestan. Its population is mostly Mohammedan. Physically the country falls into two basins: (1) the Tarim basin between the Tienshan and the Kuenlun; (2) the Zungarian basin on the borders of Mongolia.

The climate is one of great extremes, and no rain falls except among the high mountains.

The Tarim Basin has an average altitude of 3,000 feet above sea level. Its inhabitants live chiefly in the oasis towns on the rivers which unite to form the Tarim river. The river receives its supply of water from the snows of the encircling mountains, but it finally loses itself in the swamps of Lob Nor. This region was formerly a centre of civilization and abounds in ruined cities and irrigation works. What does this suggest? The great part of the Tarim Basin is taken up by the desert of *Taklamakan*, "a trackless waste of moving sands". Irrigation from the mountain-streams is possible in the oasis regions. Wheat, barley, cotton, tobacco and the mulberry are produced. Carpets of silk and felt are made in the towns. Outside the towns the population is nomadic. Large flocks of sheep, goat, cattle, camels and horses are reared and hides and skins are the chief animal products.

The largest town is *Yarkand* (70,000), the second is *Kashgar* and the third is *Khotan*. The political centre is *Urumtsi* in Zungaria which carries on a caravan trade with the Siberian Steppes. Yarkand and Khotan trade with Kashmir and India. Trade routes of the Tarim Basin pass along a line of oasis towns south of the Tienshan and also along a similar line north of the Kuenlun. These routes meet at Kashgar which is reached by caravan from Russian Turkestan. As in Manchuria there has in recent years been a considerable inmigration of the Chinese; hence every year the country is increasing in prosperity.

TIBET

This great tableland has an average elevation of over 12,000 feet. It is shut in on all sides except the east by lofty mountain barriers, on the north the Kuenlun, on the west the Pamirs and the Karakoram, and on the south the Himalayas. The trade route from the Yangtse basin crosses the ranges separating south-eastern Tibet from Szechwan and reaches Lhasa, the Tibetan capital. There is considerable trade between Tibet and India in spite of the difficulties of communication. There are three routes: (1) from Darjeeling to Lhasa; (2) from Almora to Gartok; and (3) from Simla to Gartok.

The climate is extreme, and the mountains shut out rain-bearing winds. Most of the people live in the sheltered river valleys in southern Tibet, especially in that of the *Snapo* (Upper Brahmaputra). Here fruits as well as wheat, barley and peas are grown. In the same region are the sacred lakes of Manasarowar; farther north the surface of the plateau is studded with lakes. In the valleys and on the mountain slopes there are extensive pastures where yaks, goats and sheep are reared. The yak is to the Tibetan what the reindeer is to the man of the tundra, and the camel to the man of the desert.

Tibet sends *wool*, *furs*, *borax* and *salt* to India, and gets rice and cotton piece-goods. From China it receives "brick" tea.

The population of Tibet is estimated to be two millions, and one-third of the total male population is comprised of Lamas or Buddhist monks who live in large monasteries. These Lamas are "landlords, literary men as well as priests." Tibet is virtually independent, and its ruler is the *Dalai Lama*, the High Priest of Lhasa.

Lhasa, on a tributary of the Sanpo, is the capital and a focus of routes. It contains the Palace of the Dalai Lama whose dome is said to be covered with plates of gold. Lhasa is an important market for trade with India and China.

MONGOLIA

Mongolia is nearly as large as China proper, but its population is less than two millions. We have already said that politically Mongolia is not a dependency of the Chinese Republic, but a protectorate of Soviet Russia. The climate is extreme and rainfall is very low. In the heart of the country lies the desert of Gobi or *Shamo*; the marginal lands are steppes where cattle, horses and camels are reared. The highest region of Mongolia is the Kobdo plateau in the north-west.

That part of Mongolia which lies adjacent to China is called Inner Mongolia, while the part that lies near Siberia is called Outer Mongolia. In Inner Mongolia there has been considerable immigration from China, and agriculture has been made possible by means of careful irrigation. In other parts, the people are nomads ; skins, hides, furs, and horns are the chief products.

The capital is *Urga* which lies on the important caravan route from Kalgan (north-west of Peking) to Kiakhta on the Siberian frontier. Through it pass the tea, silk, cotton and china from China proper to the Russian frontier. *Kobdo*, on the caravan route from Urga to Turkestan, is an important market for the cattle and sheep reared in the valleys.

COMMUNICATIONS OF CHINA

The roads of China are bad and are passable only for the Chinese wheelbarrow; they are impassable to horses and carts. Roads suitable for motor traffic are increasing in number very slowly. The Chinese ports were thrown open to foreign trade only in 1842 ; hence most of the trade of China was carried on by caravan along routes which pass across the high plateaus and steppes to western Asia. Even to-day much of the internal trade of the country is carried on by caravan. The chief caravan routes are :

(1) From Peking *via* Kalgan and Urga to Kiakhta on the Siberian frontier; another route across the desert to Kobdo and thence across the Altai to Siberia.

(2) From Sianfu *via* Lang-Chow to Su-chow. After entering Sin-Kiang the route bifurcates, the northern route going north of the Tarim to Kashgar, and the southern route along the southern edge of the Taklamakan to Kashgar *via* Khotan and Yarkand. From Kashgar the route crosses the Pamirs to Russian Turkestan. A branch of the northern route goes through the Ili valley to Siberia.

(3) From Sianfu *via* Lang-chow or from the Red Basin (Szechwan) to Lhasa in Tibet ; thence to Darjeeling in India.

Chinese rivers are by far the best means of inland communication. Railway building, though it began late in the 19th century, is proceeding apace. There are now over 7000 miles of railway in China proper. The railways of Manchuria have already been referred to.

Powerful wireless stations are to be erected at Kalgan, Urumtsi and Urga. One of the largest high power stations is to be erected at Shanghai. Telephones are in use in most of the important cities. An Air-Mail service between London and Shanghai *via* Siberia is now available.

EXERCISES

(1) In what directions is China capable of rapid development? Give reasons for your answer.

(2) What is ‘ loess ’? How has the Loess Basin of China been formed? What is the chief drawback of the basin ?

(3) Which is called the Red Basin ? Why is it so called ?

(4) “ China’s enormous area enables a great variety of crops to be cultivated.” Illustrate.

(5) What are the uses of the 'soya' bean? Which is the great bean-growing part of China?

(6) What geographical causes have aided the growth of Peking, Shanghai, Hankow, and Canton? Give sketches.

(7) Which of the Chinese outlying provinces is of the greatest economic importance? Give reasons for your answer.

(8) "Hongkong is the 'door-step' of China and carries on a large entrepot trade." Explain.

(9) Draw a map of China and her outlying provinces and mark he caravan routes.

CHAPTER XII

THE JAPANESE EMPIRE (Fig. 41)

The Japanese Empire has a total area of about 261,000 square miles and a population of about 77 millions. It extends from about 51° N. to the southern end of Formosa (21° 45' N.). Japan proper consists of (1) *Honshiu* (*Hondo*, mainland), (2) *Kiushiu*, (3) *Shikoku*, (4) *Hokkaido* (Yezo), (5) the *Kuriles* (Chishima) and numerous other islands. *Saghalin* (south of 50° N.) was ceded by Russia in 1905; *Taiwan* (Formosa) was ceded by China in 1895; and *Korea* (Chosen) was annexed by treaty in 1910. *Port Arthur* and its nighbourhood on the Liao-tung Peninsula whose lease was extended by China in 1915 to 99 years, are in Japanese hands. By the peace of Versailles, 1919, Japan got a mandate from the League of Nations to administer the Marianne, Caroline, and Marshall Islands which formerly belonged to Germany.

Japan is rich in natural harbours. The main islands have a mile of coastline to every 8½ square miles of area, while Great Britain has a mile of coastline to every 13 square miles. Most of the ports are on the Pacific Coast facing world markets, *e.g.*, Nagasaki, Kobe and Yokohama.

Physical features: With the exception of Korea, the Japanese Empire and its island festoons lie in a line of great volcanic activity that borders the Western Pacific (Fig. 3, page 11). On the continental side of this line, the almost land-locked seas are shallow; on the oceanic side the sea is very deep (over 5 miles, *e. g.*, the Tuscarora Deep). Japan has over 200 volcanoes, more than 50 of which are active. Earthquake shocks occur at the rate of one a day on

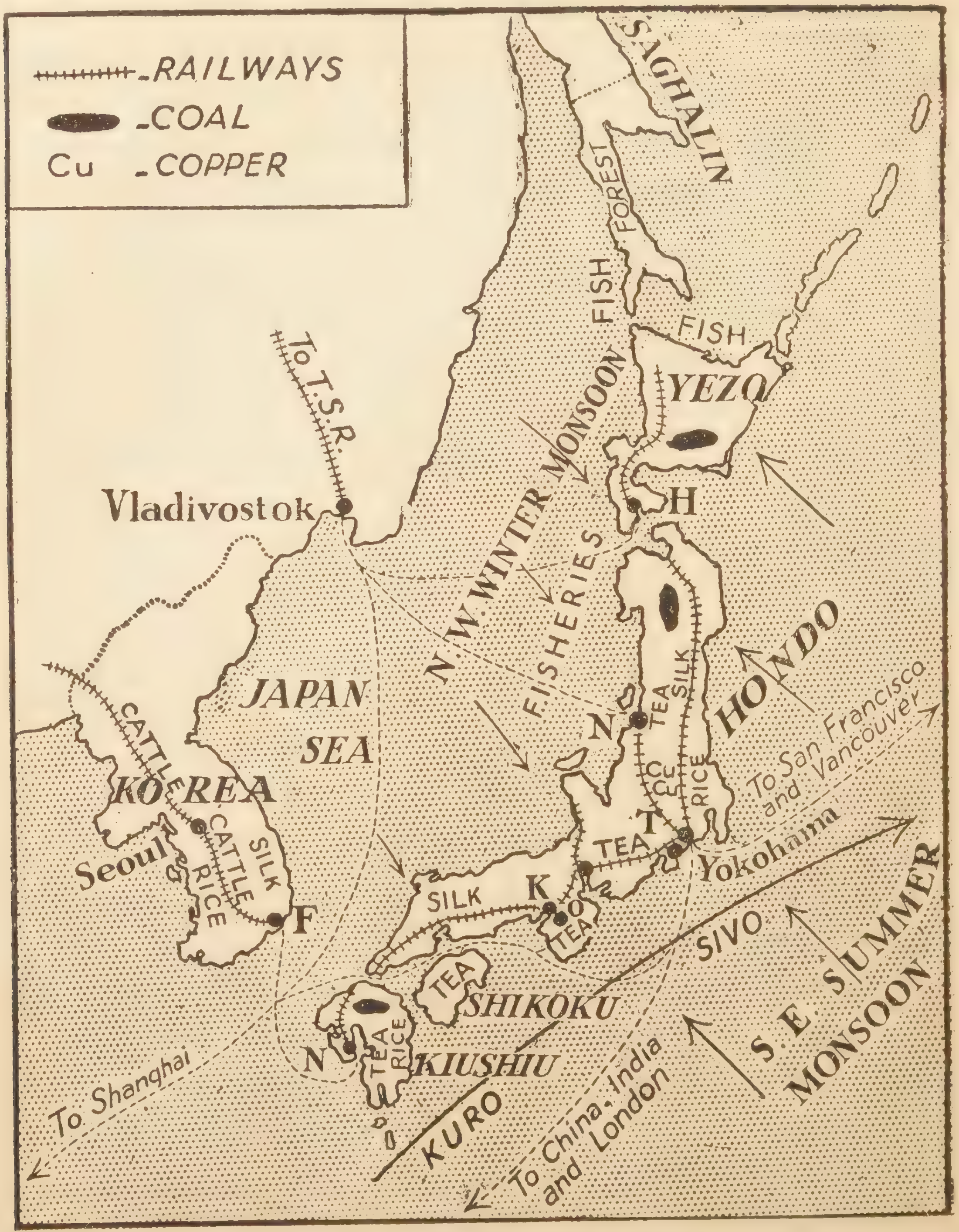

FIG. 41. **JAPAN & KOREA:** Economic.

the average. The most terrible earthquake occured in 1923, and it caused great loss of life and property in Tokyo, Yokohama and the surrounding country. Hence, the buildings in Japan are made of light materials, very often of bamboo, and sometimes even of paper. *Fujiyama* is a dormant volcano, for it has not been active for about 200 years.

Much of the surface of the main islands is covered by mountains; only in southern Hokkaido and in eastern Honshiu near Tokyo is there any extensive plainland. The nearness of the mountains to the sea and their height make the rivers short and swift. Hence they are of little value for commerce; but they form important means of transport for timber from the mountain forests, and are useful for irrigation. They supply power for big *hydro-electric works* that provide towns and villages with cheap lighting, and factories and mines with cheap power.

Climate: Japan has a monsoon type of climate. The summer monsoon from the south-east blows from the Pacific across the warm Kuro Siwo and brings heavy rains to the southern and eastern sides of the islands. The winter monsoon from the north-west takes up moisture from the Japan sea and deposits it as rain or snow on the western and northern parts of the main island. At this time of the year eastern and southern Japan has little rain; but the total amount of rainfall is greater in the east than in the west.

As the empire stretches through 29 degrees of latitude, it has many climates. The mean annual temperature ranges from 70° F. in Taiwan (Farmosa) in the south to 35° F. in the Kuriles in the north. Eastern Japan is much warmer than Western Japan, for the cold Bering current flows along the western shores between the islands and the mainland, while off the eastern shores flows the warm Kuro Siwo.

Fogs are prevalent in the Sea of Okhotsk and along the shores of the Yezo where cold air from over the Bering current meets with warm air from over the Kuro Siwo. Compare the Banks of Newfoundland.

Vegetation: Owing to the heavy rainfall, the mountains of Japan are covered with *forests.* In the cooler north coniferous trees are found ; in the main islands deciduous trees like the oak exist. Southern Japan and Formosa produce bamboos, mulberries, camphor and lacquer trees. Lacquer, the gum of the lacquer tree, is used in the decoration of many Japanese articles. The northern forests supply wood-pulp for paper making, and soft wood for matches. The mulberry leaves are used for feeding silkworms.

Pasture is scarce. and hence cattle, horses and sheep are few in number. But Korea possesses many areas suitable for pasturing. Since farm animals are scarce, much of the farming work is carried on by human labour.

Agricuture : Only about one-tenth of the total area is arable land ; but by careful irrigation and intensive culture the industrious farmers are able to make the best of their small holdings. *Rice* occupies more than half of the cultivated lands ; *wheat*, about one-third. Barley, wheat and rye are summer crops in the north, and winter crops in the south. Rice which forms the chief article of food has to be imported from Burma, China and Cochin-China. *Beans* are also important as food products ; soya beans and peas are grown in large quantities. Still a good deal of soya beans is imported from Manchuria.

Tea is cultivated on well-drained slopes in Honshiu, Kiushiu and Shikoku. The *mulberry* is extensively grown. *Cotton*, *indigo*, *tobacco* and *sugar* are other important agricultural products. *Fruits*, such as plums, grapes, oranges and apples are grown in gardens.

Minerals : The most important mineral of Japan is *copper*, the region north of Tokyo being the greatest copper-producing area in Asia. *Coal* is mined chiefly in Kiushiu behind the port of Nagasaki, in Yezo and in northern Honshiu. The Kiushiu coalfields supply 75 per cent of the total output of Japan. *Iron* occurs in many places, but not with coal; hence a considerable quantity of iron has to be imported to meet the needs of the growing steel and iron manufactures. At *Wakamatsu* are the Imperial Iron Works. *Sulphur* which is obtained from the volcanic regions has given rise to the making of matches. The presence of *kaolin* accounts for the porcelain industry. *Silver*, *lead* and *petroleum* are also found.

The manufacturing industries of Japan have developed very rapidly along West-European lines in the past 20 years. Contact with America and West Europe has made the Japanese fit to be skilful directors of industries. Long hours, and cheap and abundant labour give Japan advantages over other industrial countries. The most important industry is the manufacture of *silk yarn* and silk piece-goods. Every large centre of population spins silk. *Tokyo* is an important silk-manufacturing centre. But now *cotton* industry is becoming more important. Abundant water power for electricity and a moist climate for spinning account for the development of this industry. Moreover, Japan has a vast market at her very door, *i.e.*, China. *Osaka*, the centre of the cotton industry, is called the "Manchester of the East." *Woollens* are also manufactured here. *Shipbuilding* is carried on at Nagasaki and Kobe. *Match-making*, *paper-making*, *lacquer ware* and *porcelain* are other flourishing industries. All over Japan there are rice-mills, distilleries, flour-mills and oil and bean-cake mills.

Fishing is one of the chief occupations in Japan, and fish forms a very important part of the food of the people. The chief fishing grounds are in the shallow waters near the coast of Yezo. Fish are also used as manure for the agricultural lands. The fishing industry has helped Japan to become one of the world's great naval powers. Compare Great Britain.

Tokyo, the capital of Japan, stands on the Tokyo Bay. It is no longer a port as its harbour has been silted up by the river on which it stands. It is the focus of roads and railways and it has a university. It is an important centre for the manufacture of silks, matches, chemicals, lacquer-ware and porcelain. Prior to the earthquake of 1923 Tokyo had a population of more than 2 millions. The port of Tokyo is *Yokohama* (423,000). It trades with the mainland of Asia, and with Australia, Western America and Europe. It is the chief export-gate.

Osaka (1,253,000), the largest city, stands at the mouth of a river flowing into the Inland Sea, and is the chief seat of the Japanese textile industry. It also carries on metal and ship-building industries. *Kobe*, (609,000) is Japan's chief import-gate. Like Osaka, it engages in the manufacture of textiles and in ship-building.

Nagasaki (176,000), on the west coast of Kiushiu, has the best harbour in Japan. It has abundant coal near it, and is opposite the rich markets of China. It has naval and ship-building dockyards. *Niigata* is the chief port on the Japan Sea facing Vladivostok which can be reached in two days. *Hakodate*, the chief port of Yezo has a fine harbour and exports coal, timber, sulphur and potatoes. The main railway in Japan runs along the east coast of Honshiu and connects it with Kiushiu. In Yezo a line runs from Hakodate to the interior. The west coast of Honshiu is reached by two lines, the more important being that to Niigata. For short distances and in towns the jinrickshaw is used.

FORMOSA (TAIWAN)

Formosa, or Taiwan, has an area of 14,000 square miles and supports a population of about 4 millions. It is traversed from north to south by a mountain range which is nearer the east coast than the west. The Tropic of Cancer almost bisects the island. The climate is of the tropical monsoon type and vegetation is of the hot, wet forest variety. The most important trees are the *camphor* tree, the *banyan*, the *areca* palm and the *bamboo*. *Tea* is an important crop in the north. In the warm, wet, fertile plains of the west *rice* and *sugar-cane* are grown. Pigs, cattle and goats are reared. Horses are few, and buffaloes are used for farm work. Gold, silver and copper are mined near *Keelung*, the chief port for Japan. Coal and petroleum are also found. Keelung has the best harbour in the island.

Taiwan sends tea, rice, sugar, camphor and coal to Japan and gets in return oil-cake, tea seeds, machinery and textiles.

KOREA (CHOSEN)

Korea or Chosen, has an area of 85,000 square miles with a population of about 19 millions. It is a mountainous peninsula, the mountain backbone being very near the east coast which therefore rises steeply from a very narrow coastal plain. The western slopes pass into broad fertile plains with many towns. The climate is of the monsoon type with heavy rains in the hot season. *Rice* is the chief product grown in the plains and forms the important food of the people. Other crops are *millets*, *beans* and *cotton*. Wheat and barley are also cultivated.

Cattle and *pigs* are reared in large numbers, and supply meat for Japan and China. Silkworms are also reared. Gold and copper are mined in the north ; and the country is also rich in coal, iron, graphite and mica.

Keijo (Seoul, 250,000), the capital of Korea, stands on a navigable river on the main line from Mukden to Fusan. Its port is *Chemulpo*. *Fusan* is the chief port for Japan.

Trade is mainly with Japan. The exports are rice, beans, hides and cattle, gold and other metals. The imports are cotton goods, machinery, petroleum, sugar, paper and coal.

The Japanese, like the Chinese, are of Mongolian stock. In matters of religion, the greatest freedom is allowed. The chief religions are Shintoism* and Buddhism. The ruler of Japan is the *Mikado* or Emperor. Since the overthrow of the power of the Shogun or the military dictator in 1868, Japan has been able to carry out the most drastic social, political, military and economic reforms. She has been sending her youths to study in the foremost countries and the best universities of the world. Primary education is compulsory for all; and schools, colleges, universities and technical institutions are provided for higher education. In international affairs Japan is to-day one of the Great Powers of the world.

The Japanese are not only intelligent, but also enterprising. They are great lovers of Nature, especially of flowers, and have given the world the *chrysanthemum*. Flowering trees and shrubs make their country a land of beauty. By intensive methods of cultivation the Japanese are able to feed a dense population, though only a small part of the country is available for agriculture. Japanese manufacturers employ up-to-date machinery and scientfiic methods.

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*The indigenous system of nature and hero worship, inculcating reverence for ancestors.

Britain and Japan compared: Japan is often called the "*Britain of the East.*" Both countries are groups of islands lying off the opposite shores of Eurasia. They are within easy reach of the mainland countries which are densely populated. Both have a number of fine harbours, near to abundant supplies of coal and iron. The insular position of both countries has created a real "sea-habit" among the people. Hence each country is to-day a great maritime power. The general lie of the islands is north to south; and Honshiu, like Great Britain, is much larger than any of the others. But Japan lay too far from the world's old centres of civilization to come to the front in early times. We can also find contrasts between the two countries if we consider their latitude, structure, climate and vegetation.

EXERCISES

(1) Compare and contrast the Japanese Empire with the British Isles.
(2) Give an account of the industries of Japan.
(3) Of what importance is Chosen to Japan?
(4) Give the geographical position and importance of Tokyo, Osaka, Nagasaki, Hakodate and Niigata.
(5) Why are houses in Japan built of light materials?
(6) Japan is able to support a large population, although only 12 per cent. of the total area is available for cultivation. Why?
(7) What circumstances have made Japan one of the Great Powers of the world?
(8) Which is called the "Gulf Stream of the Pacific"? How does it influence the climate of Japan?

CHAPTER XIII

SOUTH-EAST ASIA AND THE EAST INDIES (Fig. 42)

South-East Asia includes (1) the kingdom of Siam; (2) the colonies and protectorates of French Indo-China; and (3) Malaya.

SIAM

Siam covers an area of 195,000 square miles and has a population of about 9 millions. The people are of South Mongolian stock, but like the people of Burma and French Indo-China they readily receive western ideas and adapt them to their own purposes. Education is proceeding on Western lines, and Siam has its university at *Bangkok*, the capital of the country. In this town the population is chiefly Chinese.

Siam consists largely of the basin of the *Menam* and the upper basin of the *Mekong*. The two river basins are separated by a low watershed running north to south. Siam is a monsoon land with summer rains which are heaviest near the coastland on the windward slopes of the mountains.

The mountains west of the Menam are heavily forested, and contain splendid teak. Logs of teak are hauled down to the saw-mills and teak-yards at Bangkok.

The flood plain of the Menam is covered with *rice* and *sugar* fields. Bangkok has 80 rice-mills where the rice is prepared for export. Other products are *cotton* and *millet*. Cattle are reared on the plain of the Upper Mekong which is largely a savanna country, and hides form an important article of export. The chief mineral of Siam is *tin* which is mined at *Puket Island.*

Bangkok, the centre of commerce, stands on the Menam, about forty miles inland. A bar at the mouth of the river prevents large vessels from reaching the city; so, much of the trade of Siam passes through Singapore and Hong-kong. Bangkok is now directly connected with Singapore by railway. The chief exports of Siam are rice (about 80 per cent of the total), teak and tin. The imports are cotton and cotton yarn from Britain, Japan and India, gunny bags from India; and hardware and machinery from Britain.

FRENCH INDO-CHINA

French Indo-China covers an area of 257,000 square miles and has a population of about 20 millions. It includes the colony of Cochin-China and the protectorates of Cambodia, Annam and Tonking. Cochin-China and Cambodia are in the lowlands of the Mekong; Tonking occupies the delta of the Red River; Annam is the narrow coastal plain between the eastern ridges and the South China Sea.

The Mekong is a swift-flowing river obstructed by rapids and is therefore accessible to small vessels only in its lower reaches. As in the case of the Yangtse, much surplus water from the summer floods flow into the natural reservoir of *Tonle Sap.* Like Siam, French Indo-China is a tropical monsoon land. Rainfall is heavy during the summer months. Annam gets most of its rain when the North-east monsoon blows.

Rice is the chief crop of the flood plains of the lower Mekong and Red River. It is the chief article of food, and is largely exported. *Coffee* is grown on the hills of Annam, *sugar* in Annam and Cambodia, and *pepper* in Cochin-China. *Cotton* is increasing in importance in Cambodia, so that the Mekong there is called the "Nile of Cambodia." There are *rubber* plantations in Cochin-China, and *coffee* plantations in Tonking. Cattle and buffaloes are reared for meat and for draught purposes.

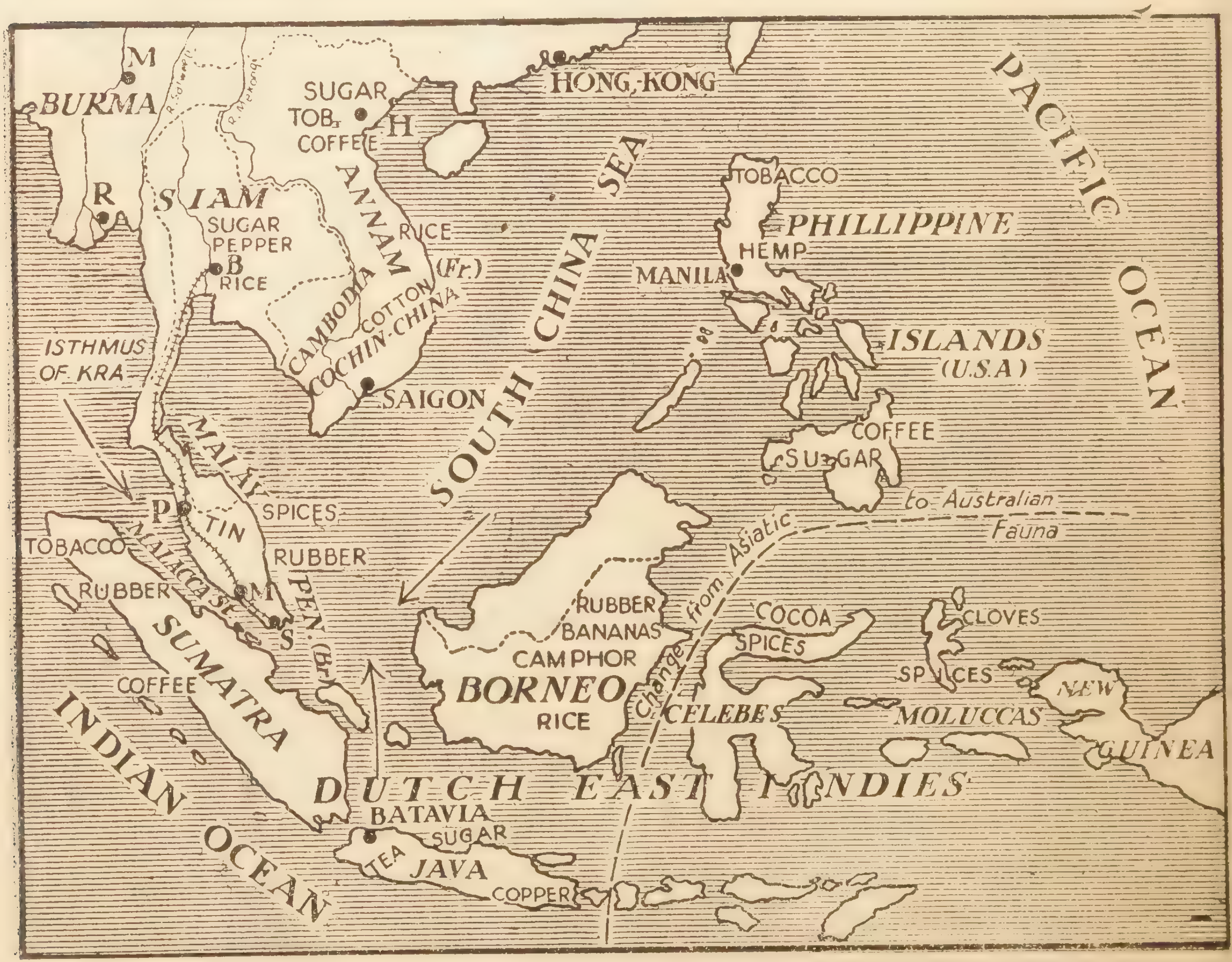

FIG. 42. INDO-CHINA and THE EAST INDIES: Economic.

The capital of Tonking is *Hanoi* situated about 60 miles up the Red River. It was once on the sea coast. It is connected by a railway with *Yunnan* in south-western China. *Hue*, the capital of Annam, is a very poor port as it is exposed to strong winds and storms. *Saigon*, the capital of Cochin-China, has a good harbour.

Most of the trade of Indo-China is with France. Rice is the chief export, but cotton, rubber, sugar, tea and copra are increasing in importance.

MALAYA

Malaya consists of the mountainous peninsula south of the Isthmus of *Kra*. Politically it falls into three divisions: (1) The *Straits Settlements* (a crown colony) including Singapore, Penang and Malacca ; (2) the *Federated Malay States* under British protection ; (3) the *Unfederated Malay States* having British advisers. The whole region has an area of about 53,000 squre miles and a population of less than 3 millions.

Malaya lies in the path of both the monsoons and has rains throughout the year. The annual rainfall exceeds 100 inches and temperatures are uniformly high. Hence dense tropical forests are the characteristic vegetation and the chief products are those of the plantations. *Rubber* has become most important in recent years. Between the rows of planted young rubber trees, *coffee*, *pepper*, and *tapioca* are grown. *Coconut* plantations yield coir, copra, coconut oil and *poonac* (cattle food). *Rice* is grown on the lowlands, but large quantities have to be imported.

Tin mining is of great importance, as nearly half the world's annual supply of tin comes from the tin mines of Malaya. The biggest mines are in the Federated Malay States.

Singapore (437,000), the most important city in the Straits Settlements, stands on the southern side of Singapore island which is separated from the mainland by a strait, about three-quarters of a mile in width. It is connected with the railways of the Malay peninsula by a line passing over a causeway that is built across the strait. The importance of the town is due to its position (Fig. 43) at the converging point of great ocean routes to and from India, China, Japan and Australia. Hence the port has developed an enormous *entrepot* trade. It has a rich hinterland yielding tin, rubber, coffee, coaco, sago, spices, timber and tropical fruits. It has a fine harbour with extensive dockyards on the highroad between the Indian and Pacific Oceans. It is also a fortified coaling station.

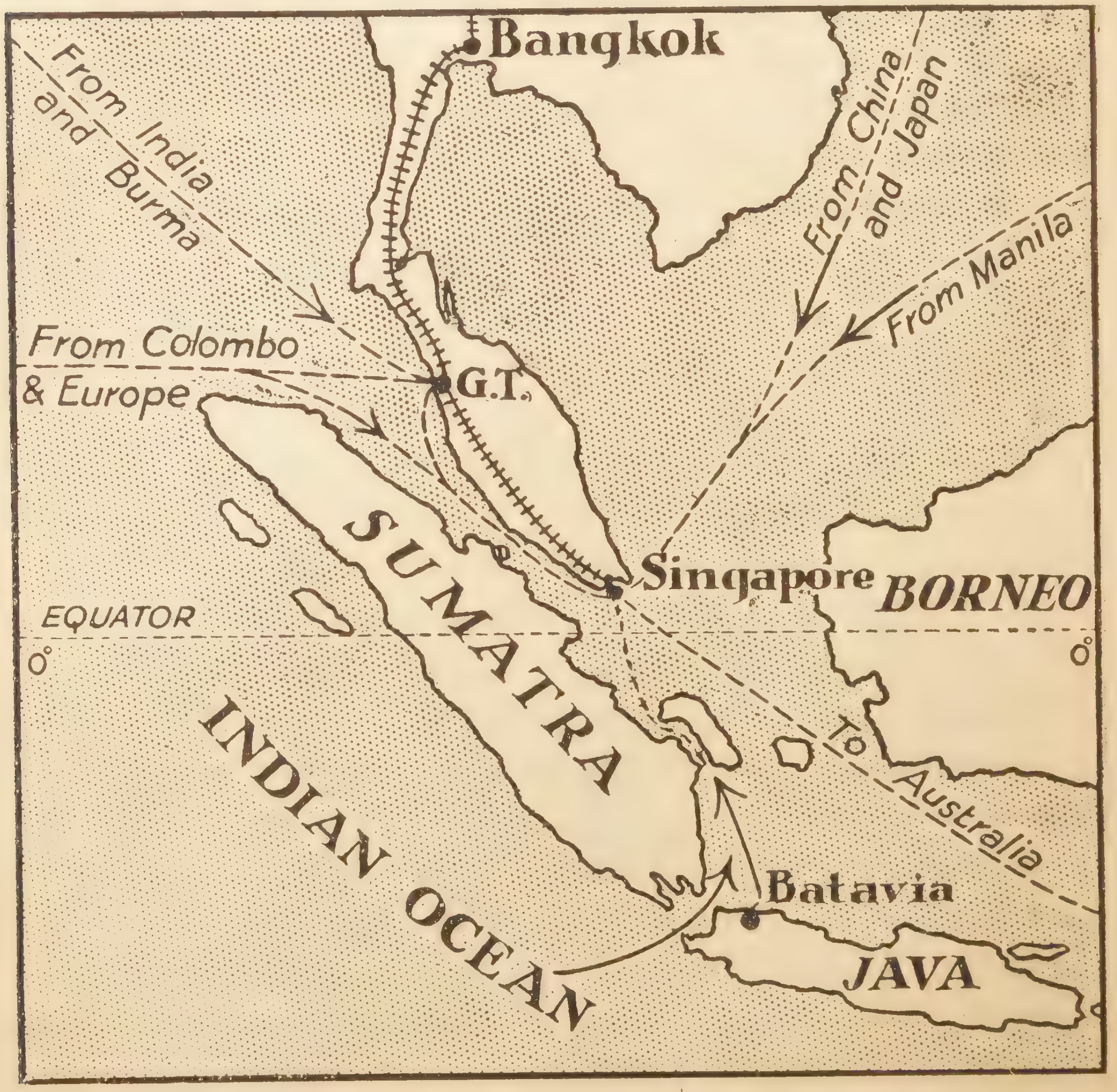

FIG. 43. Position of Singapore.

Penang (George Town) exports tin and rubber. It stands on an island and is linked with *Wellesley Province* by steam ferries. It has a powerful wireless station. *Kuala Lumpur* is the capital of the Federated Malay States.

Christmas Island and the Cocos Islands in the Indian Ocean, south-west of Java, and the island of Dabuan, six miles from the north-west coast of Borneo are also included in the Straits Settlements. Labuan has a rich coalfield and sends its coal to the steamers at Singapore. Christmas Island has valuable deposits of *phosphates of lime;* and the Cocos Islands are coral islands covered by *coconut palms.*

THE EAST INDIES

The islands of *Sumatra, Java, Borneo* (except North-west Borneo which is British), *Celebes* and the *Moluccas* are Dutch territory, while the *Philippines* are American.

*Wallace's * line* (marked in Fig. 42), which passes through the Strait of Macassar and between Bali nnd Lombok divides the East Indies into two natural regions : (1) The *Asiatic* islands having Asiatic vegetation and animal life. *e. g.*, Sumatra, Java and Borneo ; (2) The *Australian* islands with vegetation and animals like those of Australia.

The temperature is uniformly high, and both the S. W. and N. E. monsoons bring abundant rain. Hence the islands are rich in all kinds of tropical vegetation. They are densely forested, and on the coastal plains and in the forest clearings rubber, coffee, sugar, cacao, tea, coconuts and rice are grown.

Java is the most important of the Dutch East Indies. Though it covers only 7 per cent of the total area, it supports a population of 36 millions which is 72 per cent of the total population. Over 40 per cent of Java is under cultivation.

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* Named after the great naturalist.

The development of the island is due to the great fertility of the volcanic soil and the abundant rainfall. The mountain chain traversing the whole length of the island is said to contain more than fifty volcanoes. The chief crops are *rice*, *sugar-cane*, *tea*, *coffee*, *cacao*, *rubber*, *tobacco* and *cinchona*. Much sugar is exported to India. The capital of Java is *Batavia*. The other Dutch possessions have been little developed. Sumatra and Dutch Borneo export pepper, coffee and spices. Celebes and Moluccas are noted for spices.

British North Borneo is under the control of the British North Borneo Company. It produces *sago*, *rice*, *coconuts*, *coffee*, *spices*, *rubber*, *camphor* and *tobacco*. *Brunei*, a native state under British protection, produces *sago* and *rubber*. *Sarowak*, also under British protection, is ruled by a British Rajah (a descendant of Sir James Brooke who obtained it from the Sultan of Brunei). It has rich deposits of coal and petroleum as well as some gold. The *Dyaks*, the natives of Borneo, are very backward, and those living in the little known interior regions are cannibals even to this day.

The Philippines (more than 7,000 islands) have belonged to the U. S. A. since the war with Spain in 1898. The population is over 10 millions, chiefly of Malay race. Throughout the islands, earthquakes are frequent ; and they are also often visited by terrible destructive storms called *typhoons*. The chief products are *rice*, *manila hemp* (a fibre obtained from a wild plantain), *coconuts*, *sugar-cane*, *maize* and *tobacco*. The *forests* yield rattan canes, bamboo. and tan barks. The islands are also rich in *minerals*. The capital and leading port is *Manila*. Routes from Hongkong, Singapore, Australia and the western shores of America meet here. It is the centre of the cigar manufacturing industry. It has also an excellent university.

EXERCISES

(1) What geographical conditions have aided the growth of Singapore and Manila? Draw sketch maps to illustrate your answer.

(2) Find out from a good political map of S. E. Asia, the names of the Federated Malay States.

(3) Why has Malaya two distinct wet seasons?

(4) What differences would you expect to find in the seasonal distribution of temperature and rainfall at Manila, Singapore and Batavia?

(5) Why is Java the most densely peopled island in the whole of the East Indies? What article is imported from Java into India?

(6) How does the cultivation of rubber in Malaya affect the production of rubber in the Amazon basin? (Refer to South America).

(7) What is 'Manila hemp'? For what purpose is it used? Name other 'hemps' used for the same purpose.

(8) What will be the effect of a ship canal cut through the Isthmus of Kra?

REVISION

CHAPTER XIV

NORTH AMERICA AND EURASIA
COMPARISON AND CONTRAST

North America and Eurasia lie in the same hemisphere, stretching over a great extent of latitude ; but Asia extends as far as the equater, and North America stretches much farther towards the North Pole than Eurasia. The west coast of North America is washed by the warm North Pacific Drift, and the west coast of Europe by the warm North Atlantic Drift. Near the east coast of North America runs the warm Gulf Stream, and near the east coast of Asia the warm Kuro Siwo. The cold Labrador current of North America corresponds to the cold Bering Strait current of Eastern Asia. The fishing grounds near Newfoundland correspond to the fishing grounds of the continental shelf of Western Europe and those of Northern Japan.

North Amarica narrows towards the south, while Eurasia narrows towards the west. Asia is more than twice the size of North America, but it has an extensive waste of deserts and plateaus, while North America has wide interior plains. The line of folding stretches from north to south in North America, while in Eurasia it is from west to east.

The Hudson Bay corresponds to the White Sea depression and the Gulf of Mexico to the Mediterranean. The lakes in north-west Canada have their parallel in the lakes of Finland. Both the continents have extensive archipelagoes in the south-east.

The Westerlies are prevailing winds in the northern half of both North America and Eurasia. They give a mild and moist climate to British Columbia and North-west Europe. But the mountains of North America form a climatic barrier and prevent the landward extension of oceanic conditions, while in Europe there are no north to south barriers to prevent the oceanic winds, so that in summer the westerlies are drawn in far into the interior and give rain to Russia and Siberia. It is the absense of an east to west mountain barrier in North America that allows the "cold waves" to sweep over great oxpanses of country from north to south. The interior of both the land masses has a continental climate. California has winter rains like the Mediterranean region. The West Indies and South-east U. S. A. are swept by violent tornadoes as the East Indies and South China coast are swept by destructive typhoons.

Both North America and Eurasia have a northern belt of *tundra* which is still the home of uncivilised people who live by hunting and fishing. Both are crossed by a broad belt of *conifer forests*, the home of trappers and lumbermen. But the timber, wood-pulp and paper of North America can be shipped from both the Atlantic and Pacific seaports, while Asia (Siberia) can ship her forest products only eastward down the Amur to the Pacific. These products can be sent to Europe only by rail which is very expensive. This is the chief reason why lumbering is not so well developed in Siberia as in Canada.

South of the forests in both the continents are wide areas of natural grassland, the *prairies* of North America and the *steppes* of Eurasia. Both these are now being turned into fields of grain, or are being used as grazing-land for cattle and horses. In Eurasia south of the steppes are poorer lands where rainfall is less, and where animals are reared. In North America, the poorer lands lie to the west of the prairies on the leeside of the Rockies; but in many places these lands have been turned into grain-lands by scientific irrigation. The desert of North America is much smaller in extent than that of Asia.

There is no region in North America that can be compared to the Monsoon Lands of Asia which are the most densely peopled part of that continent. The densest population of North America is to be found in the north-east part of the United States. Here the people live by manufacturing and trading like those of Western Europe and not by farming as dwellers in the Monsoon Lands do. The long coast-line, the mild climate, the navigable water-ways and the vast resources of coal and iron have made Western Europe a great industrial and commercial land. As North America has been occupied mostly by people from Western Europe, and as it also has rich deposits of coal, iron, oil and natural gas, it has also become a great industrial and commercial continent. But Asia is not a manufacturing continent; its people live much in the same way as their forefathers did a thousand years ago. But in Japan, India and China a change has occurred; "Japan is already a great manufacturing nation, India has gone far in that direction, and China is making a beginning."

Europe is a very densely peopled continent; and North America is sending to it many things that are needed by its millions of people: *viz.* wheat, maize, meat, timber, fruits, cotton, oil and metals. Nearly all of these are products of temperate lands; but Asia sends to Europe the products of the tropical Monsoon Lands and the Equatorial Lands: *viz.* rice, teak, tea, silk, rubber, sago, sugar, vegetable, oils and spices. North America is rapidly increasing the number of her factories and mills and her population is also increasing; so more and more raw materials will be required for her town needs, and therefore less and less manufactured goods will be imported from industrial Europe. Asia, on the other hand, will be sending her spare raw products to Europe and buying her manufactured goods for a long time.

Both North America and Eurasia are crossed by trans-continental railways, *e. g.*, the Canadian Pacific Railway from Vancouver to Halifax in Canada, and the Trans-Siberian Railway of Siberia which is connected with the European railways. They are important links in the round-the-world routes. Both in Canada and in Siberia the railways are useful in bringing new settlers to the lands where they can farm and rear cattle, horses and sheep. In both cases the settlers come from Europe.

The eastern half of Canada is rich in gold and other metals as is the eastern halt of Siberia. But Canada has her densest population in the basin of the St. Lawrence, while siberia has a scanty population in the basin of the Amur. In spite of the large extent of uninhabitable land in its interior, Asia has five times the population of North America. This is due to the fact that Asia is an "old" continent where great empires flourished at a time when the ancestors of the present people of Europe were little better than savages, while North America is a "new" continent that came to be occupied by civilised people only in the last two or three centuries.

The people of Europe and North America are of the same race, and therefore of the same civilisation ; while the peoples of Asia are of different races with different civilisations.

* * *

ERRATA

PAGE	LINE	FOR	READ
3	16	Mannora	Marmora
10	25	Huang-Ho	Hwang-Ho
11	1	Okotsk	Okhotsk
47	8	black	block
56	7	Cumbrian	Cambrian
57	15	Chesire	Cheshire
67	9	New Castle	Newcastle
75	10	Cailais	Calais
79	3	Rivers	Riviera
93	15	populations	popoulation
128	25	mort	most
129	1	also	to be
131	8	pleteau	plateau
137	2	a state of virgin forest	virgin state
141	26 after	'Hence' insert	'the'
173	24	flow	flows

PART II

THE INDIAN EMPIRE

THE INDIAN EMPIRE

CHAPTER I

POSITION, SIZE, RELIEF, RIVERS, SOILS AND MINERALS

THE INDIAN EMPIRE, one of the most important members of the British Commonwealth, includes India proper, Burma, and a few islands off their coast and also Baluchistan. India proper consists of all the lands lying between the Himalayas and Cape Comorin. It can be considered more a continent than a country; for it is "a collection of countries differing in physical features, climate, productions, and in races, languages and religions of the people" inhabiting them. But contact with the west has brought about an awakening in the country which tries to unify all the people of different races, languages and religions.

Included geographically in India are the independent States of Nepal and Bhutan on the southern slopes of the Himalayas and the island of Ceylon in the south-east.

POSITION (FIG. 1)

India forms the middle of the three great southern peninsulas of Asia. Compare it with Italy in position and relief. It lies entirely to the north of the equator, extending from (Cape Comorin) 8° to 37° North Latitude. The Tropic of Cancer passes right through the country dividing it roughly into two halves; hence India is a tropical country. The Indian Empire stretches from longitude

2. P. Vajravelu.

61° to 101° East. Notice that the 80° E. meridian which passes through Jubbulpore and along the Madras coast occupies almost the central position.

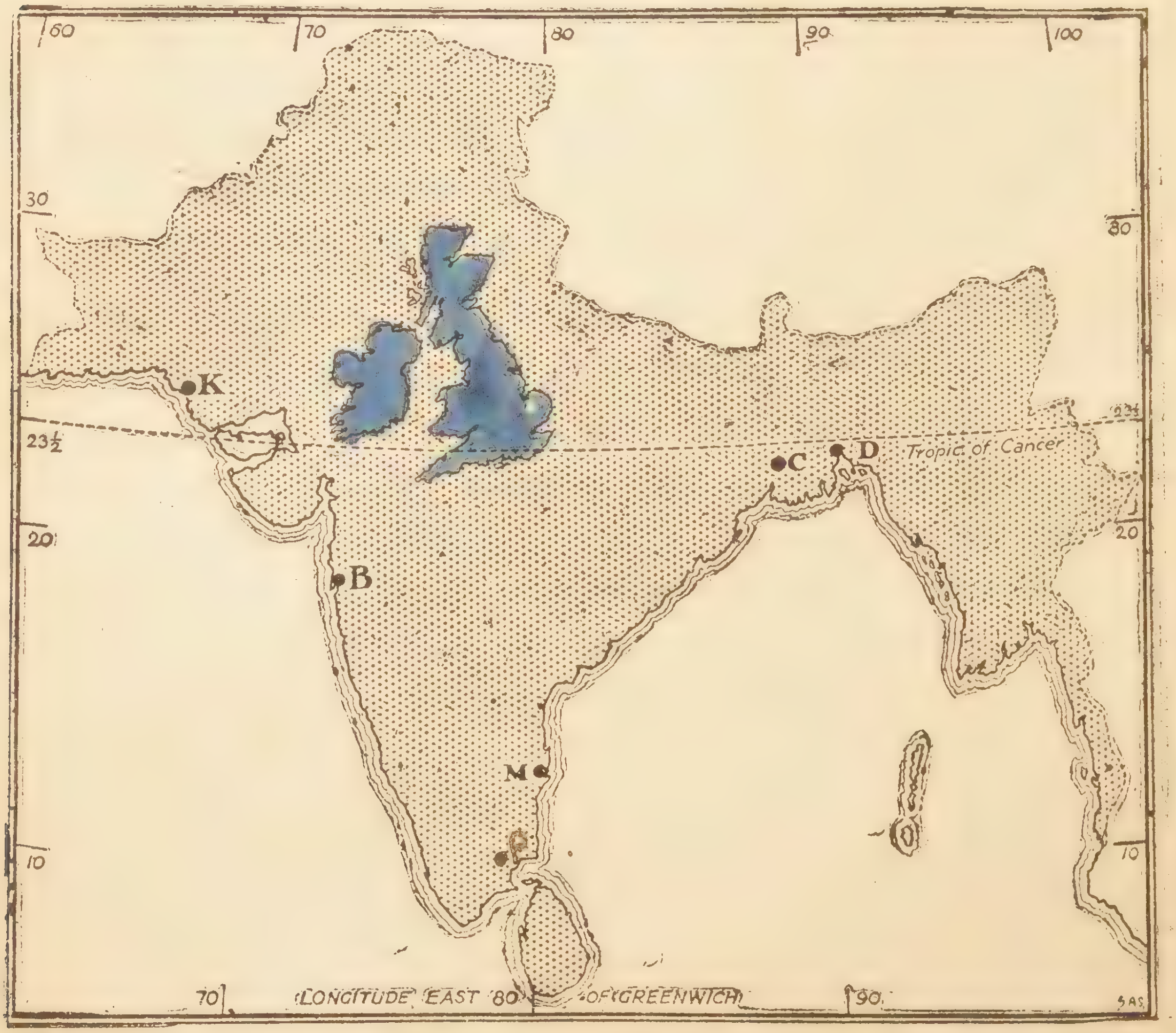

FIG. 1. POSITION OF INDIA AND COMPARATIVE AREAS OF INDIA AND THE BRITISH ISLES.

India takes its standard time from the meridian of 82½° E. which is 5½ hours in advance of Greenwich time. How many minutes is this in advance of Madras (80¼° E.) time? Burma has its own standard time which is one hour in advance of Indian Standard time.

SIZE AND SHAPE

The greatest length of India from the north of Kashmir to Cape Comorin is about 2,000 miles, and its greatest breadth from the most westerly point of Baluchistan to the most easterly point of Burma is about 2,500 miles which is nearly one-tenth the circumference of the globe. Its area is about 1,800,000 square miles, approximately fifteen times that of the British Isles (Fig. 1).

Northern India is rectangular in shape, and Southern India is triangular. The whole of India may be taken to be rhomboidal with an acute apex pointing towards the Indian Ocean.

BOUNDARY

From the physical map of Asia in your atlas, you can easily see that India is cut off from the rest of the continent by mountain walls. In the north-west the mountain wall cuts off India from Persia and Afghanistan, on the north it divides India from Tibet, and on the east the mountain wall cuts off Burma from India. On all other sides, India is bounded by the Indian Ocean. On the east of Burma lies a mountain wall which cuts it off from China, French Indo-China and Siam.

COAST-LINE

Compared with the area of the country the coast-line of India is short, for there are very few inlets of the sea. Hence India has few large and deep sheltered harbours. The west-coast of India is rocky, and the sea is somewhat deep quite close to the coast. Bombay, Goa and Cochin have good natural harbours. The first of these is due to island protection. The last is partly blocked by sand; but harbour works are being constructed. The chief inlets on the west coast are :

(1) *The Ranns of Cutch*, divided into the Great Rann and the Little Rann;

(2) *The Gulf of Cutch*, little better than the Ranns;

(3) *The Gulf of Cambay* which is shallow and gradually silting up;

(4) *The Backwaters of Malabar, Cochin and Travancore* which are shallow lagoons connected together by narrow channels.

The Ranns of Cutch are very shallow and little more than swamps in the rainy season. In the hot season they become dry barren stretches of salt sand. The backwaters of Malabar form important waterways but they are only fit for small boats and canoes. They lie behind sand dunes along the coast. The water of the streams coming from the hills is prevented from reaching the sea by the line of sand dunes, and spreads out to form these backwaters.

The east coast of India is less rocky and the sea along the coast is shallow for a long distance out from the shore. Hence ships have to anchor three or four miles off the sea ports, and loading and unloading of cargoes is done by boats from the shore. The *Pulicat*, *Kolair* and *Chilka Lakes* on the east coast are of little importance as they are all shallow inland lakes connected with the sea by channels which are easily choked up with sand and silt.

The only important harbour on this coast is that of *Madras* which has been built by man. Its entrance has been turned northwards, because the sea-current set up by the summer monsoon winds runs northward along both coasts carrying sand with it, and blocks up river mouths and ports. The Gulfs of Cambay and Cutch are becoming shallower on account of the action of this sea-current. The shallow water along the mouths of the Ganges is also caused by the sea-current meeting the water of the river and causing it to deposit its silt. The estuary of the *Hooghly* on which *Calcutta* stands has to be constantly dredged.

The coast-line of Burma is very much broken up and fringed with numerous islands. There are many inlets, but important ports are few as the mountains lie close to the coast. The only port of importance, *Rangoon*, lies on a river estuary.

RELIEF

Figure 2 shows the relief of India, the elevation of the land and also the depth of the sea surrounding it. If the land were to sink some 900 feet below its present level, the northern plains and the coastal strips would disappear below the water. Compare the relief map with the physical map of India in your atlas. How is the elevation of land represented on the two maps?

The continental shelf of India is narrow except in the south-east. Here lies Ceylon, an island structurally belonging to India, but politically separated from it. The island is very nearly joined to India by a line of sand banks and rocks called *Adam's Bridge* which lies between the islands of Rameswaram and Mannar.

India proper falls into four *physical* divisions (Fig. 3):—(1) *Mountains of the north*; (2) *Plains in the centre*; (3) *the Plateau in the peninsular south*; (4) *the Coastal strips on the east and west of the plateau.*

(1) The Mountains: These include the Himalayas, on the north, the highlands on the north-west, the hills on the north-east and Yomas of Burma.

The Himalayas (Fig. 4 & 5), the loftiest and the most magnificent of mountains, stretch in a sword-like curve for 1,500 miles across the north of the country. They consist of three parallel ranges:—

(1) *The Great Himalaya* or *the Inner Range* is a single range lying above the limits of perpetual snow. It

The shallow sea lying round a continen
or land mass.

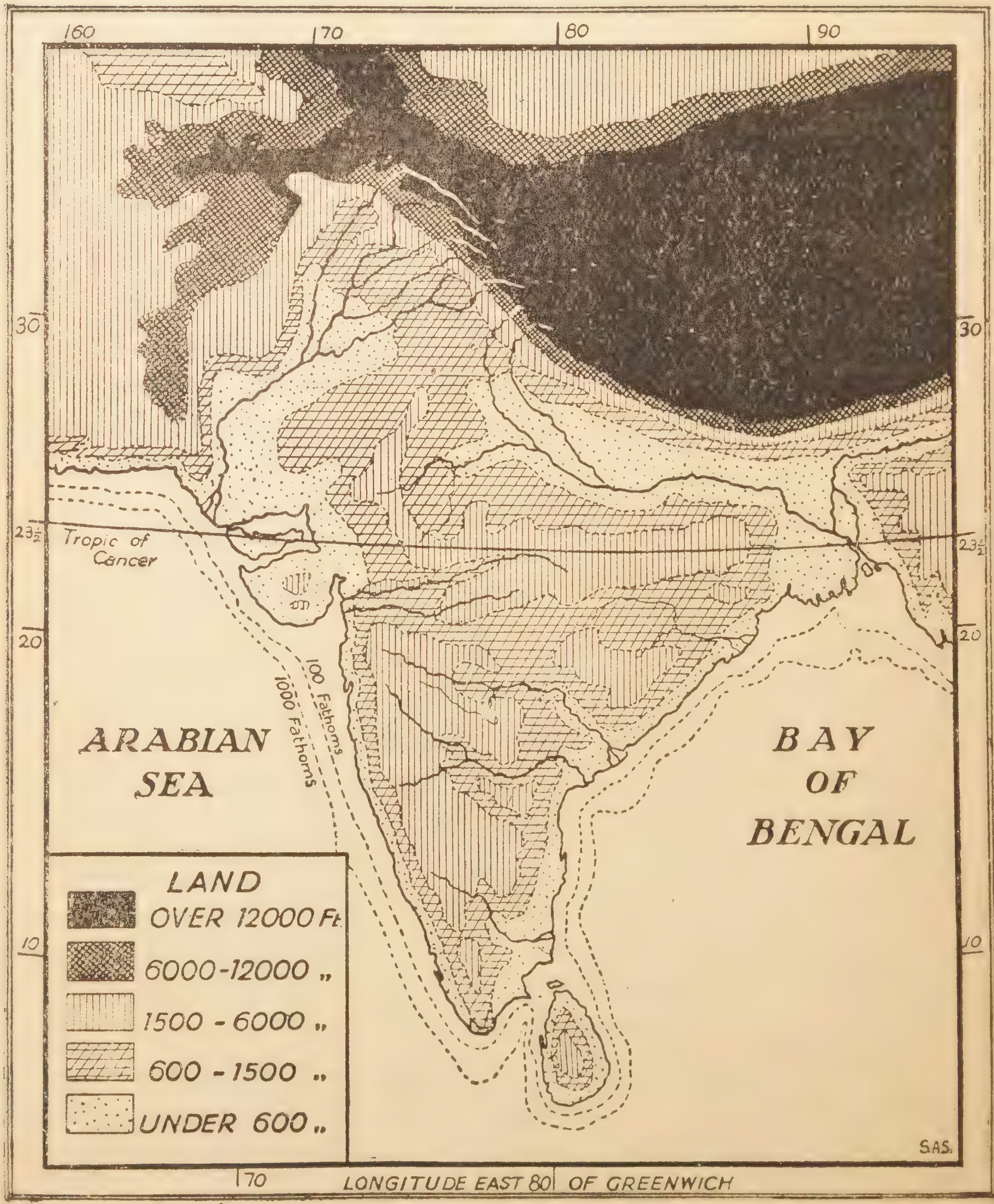

FIG. 2. RELIEF OF INDIA.

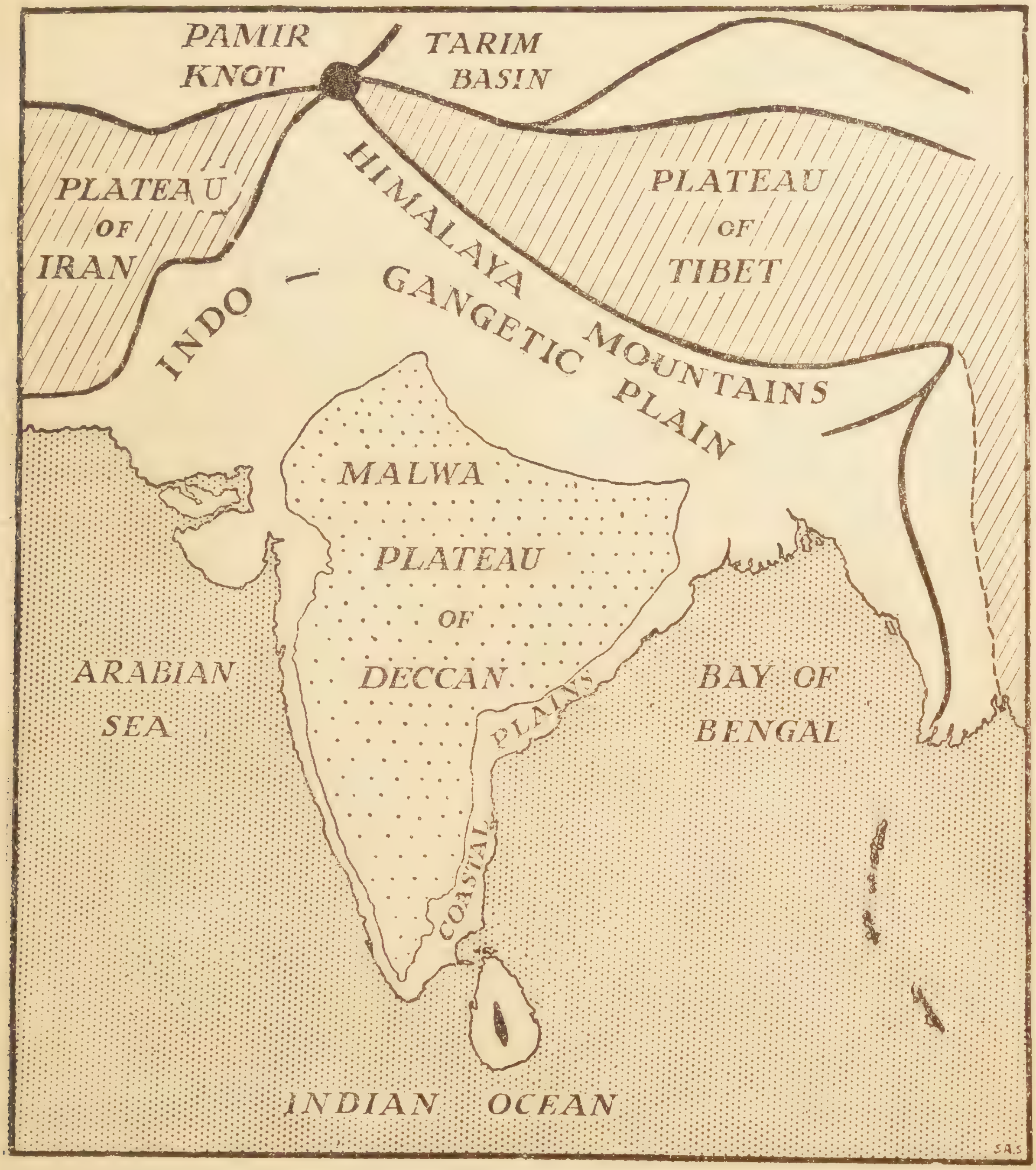

FIG. 3. PHYSICAL REGIONS OF INDIA.

lies within the embrace of two rivers, the Indus in the west and the Brahmaputra in the east. It extends from the peak *Nanga Parbat* (26,620 feet) to the north-east corner of Assam. The range contains all the snow-clad peaks whose average height is more than 20,000 feet. The chief peaks are *Nanga Parbat* (already mentioned), *Nanda Devi* (25,645 feet), *Dhaulagiri* (26,828 feet), *Mt. Everest* (29,002 feet) and *Kanchinjunga* (28,146 feet).

(2) *The Lesser Himalaya* or *the Outer Range* is a vast series of ranges rising to heights varying from 6,000 to 10,000 feet. This runs south of, and roughly parallel to, the Inner Range. At the western end the two ranges open out and enclose a broad valley. This valley which contains the *Wulur Lake* is called the *Vale of Kashmir*, one of the most beautiful valleys in the world. The outer range is here known as the *Pir Panjal.*

(3) *The outermost* or *Sub-Himalayan Range* is not high and has an average elevation of 3,000 feet. The *Siwaliks* and the *Salt Range* are parts of the western half of this range. In the east it forms the southern boundary of Nepal and Bhutan. Another great range, which is really a part of the Himalayan system, runs eastwards from the Pamir knot, and is known as the *Mustagh* or *Karakorum* Range. One of its highest peaks is *Mt. Karakorum* or *Mt. Godwin Austen* (28,250 feet). Along the southern slopes of the central part of the outer Himalayas lies a broad belt of jungle called the *Terai*, the home of wild animals. It is most feverish and unhealthy in certain parts of the year. Above a height of 5,000 feet the Himalayas are healthy, and the hill stations are situated there; *e. g.*, *Murree* (7,500 feet), *Simla* (7,100 feet), *Naini Tal* (6,400 feet), *Darjeeling* (7,000 feet).

Passes of the Himalayas: None of the passes are under 17,000 feet, and so the Himalayas are practically impassable for an enemy. But there are three passes which are now used as gateways of trade :—

(1) the *Jalapla Pass* route leading from Darjeeling across the Himalayas and over the Brahmaputra to Lhasa, the capital of Tibet;

(2) the *Shipki pass* route leading from Simla by the Sutlej valley to Tibet;

(3) the third route leading from Leh on the Indus

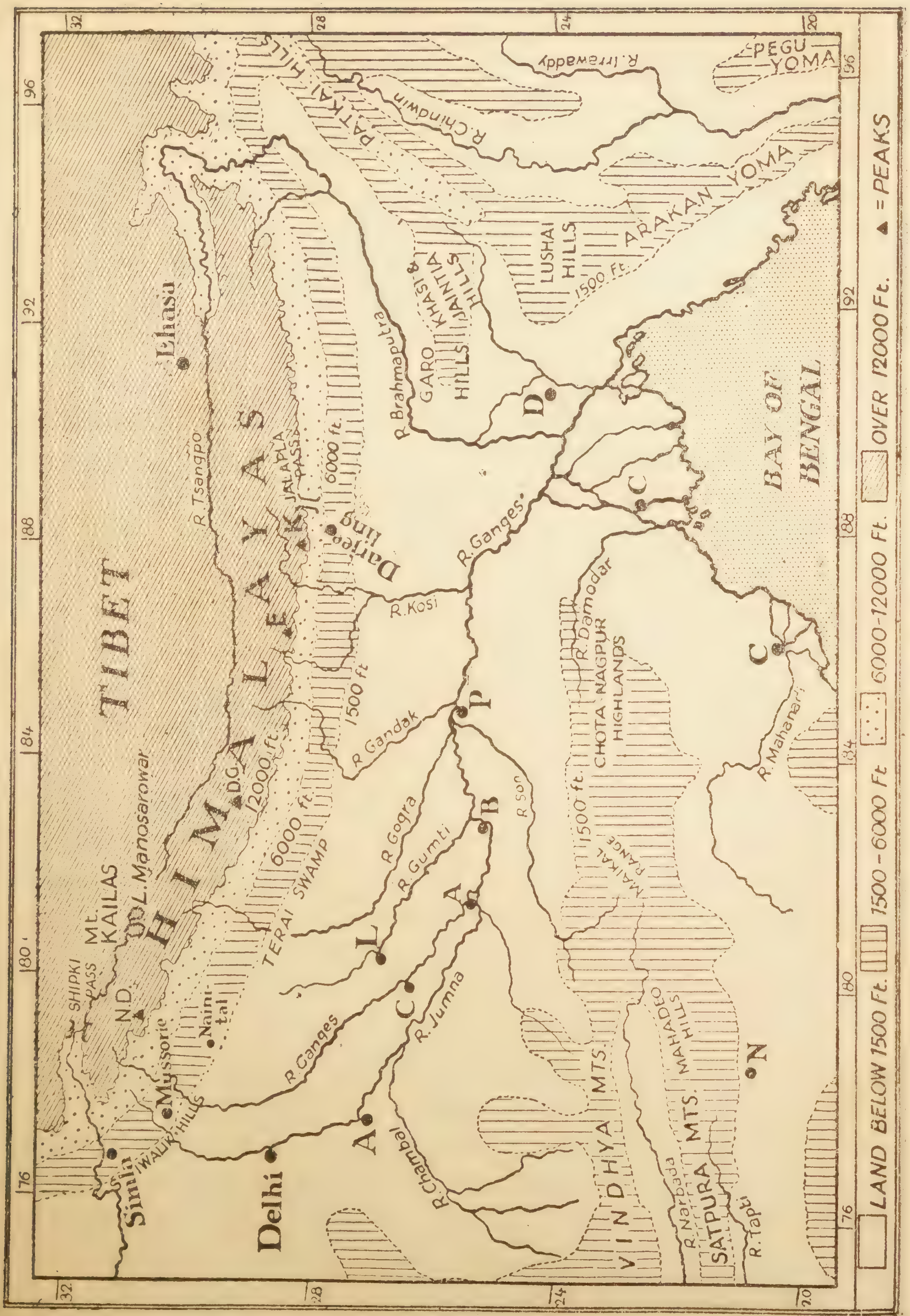

FIG. 4. THE HIMALAYAS (CENTRAL & THE EAST):
(Showing the chief hill stations and the Ganges basin.)

in Kashmir by the *Karakorum Pass* to Yarkand in Sin-Kiang. Leh is reached from Srinagar in the Vale of Kashmir by the *Zojila Pass* in the Inner Himalaya.

The North-western Highlands (Fig. 5) include (1) a portion of the *Hindukush* and its spurs running down to the valley of the Kabul River; (2) the *Safed Koh*, lying south of the Kabul River; (3) the *Sulaiman Range* running almost north aud south; and (4) the *Kirthar Mountains*, also running north and south. These north-western mountains are comparatively low, and have been sawn through by rivers; hence there are very many passes. It is by these passes that India has been invaded from the north-west in bygone ages.

The chief passess are:—(1) the *Khyber*, (2) the *Kurram*, (3) the *Tochi* and (4) the *Gomal passes* leading into Afghanistan, and (5) the *Bolan-Harnai* passes leading into North Baluchistan. The *Khyber pass* leads from Peshawar to Kabul. All invaders with Ghazni or Kabul as base and Peshawar as objective have passed through this pass. The military invasions and the great races that passed through this route have shaped the destiny of India. Hence it is the most important of the passes in the north-west frontier. It is a military as well as a trade route. The railway from Peshawar to Jumrud has been extended to Landikana on the Afghan frontier. The *Kurram Pass* lies over the Safed Koh. The *Tochi valley* leads from Bannu or Edwardsabad to Ghazni. This route was followed by Muhammed of Ghazni. The *Gomal route* connects Dera-Ismail-Khan with Ghazni or Kandahar. This is an important trade route even today. The *Bolan-Harnai* passes lead from the plains of Sind to Quetta, an important military station in British Baluchistan. Railways run up the Bolan and Harnai valleys to Quetta, from where

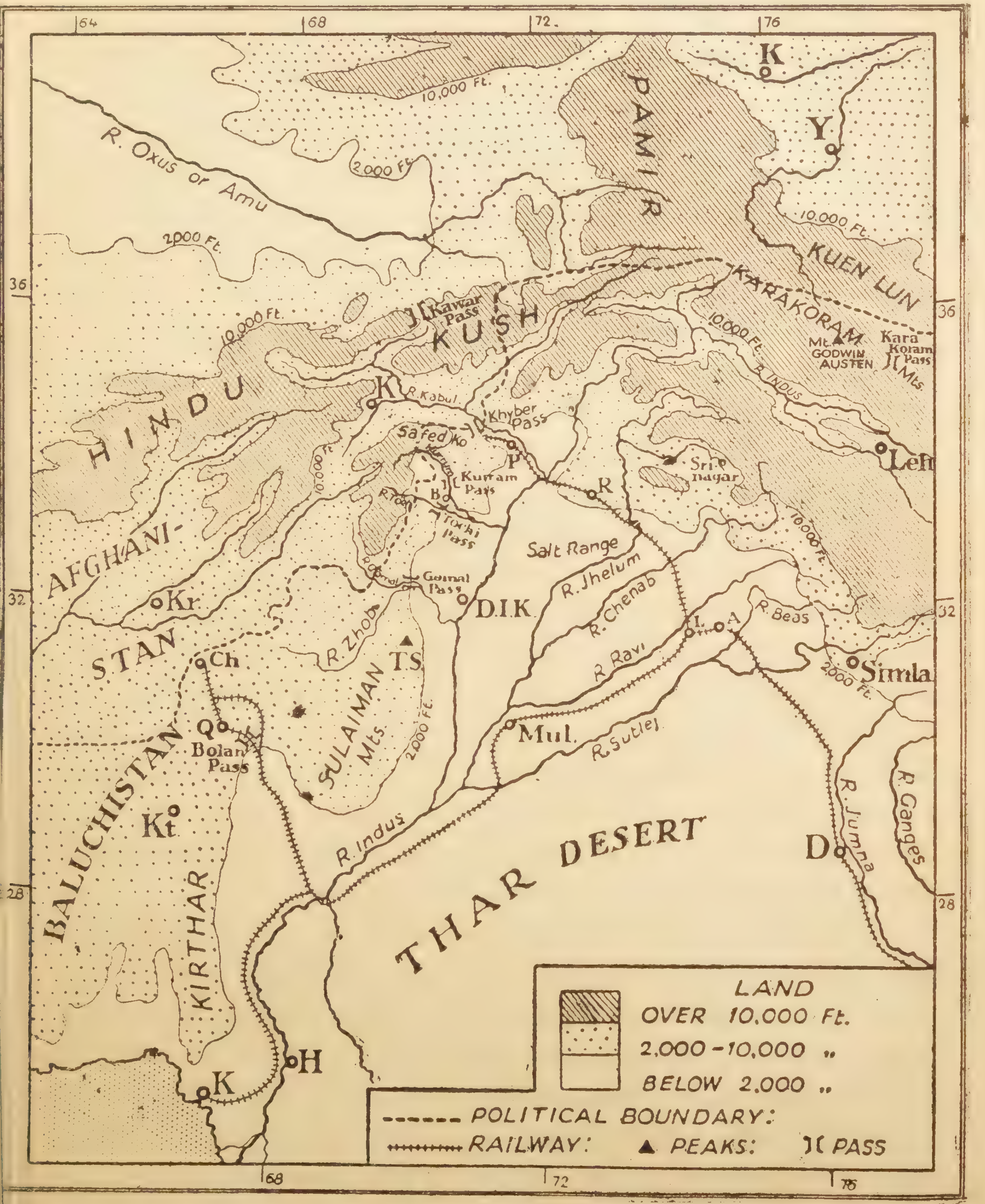

FIG. 5. MOUNTAINS AND PASSES OF NORTH-WEST INDIA AND THE INDUS BASIN.

the line is carried farther west to the Afghan frontier. The north-west frontier is the only land side where India is threatened with invasion; hence troops have been concentrated at certain important points commanding the passes. All routes to the north of the Sulaiman Range are dominated by Kabul, and those south of it are dominated by Quetta; hence Kabul and Quetta are said to be the two keys to the north-western gates of India.

At the Northern edge of the Kirthar mountains lies the *Mulla Pass*, a long circuitous defile connecting Khalat with the Kachhi Gandava plain. The mountains to the south of the pass form an unbroken barrier up to the sea.

Baluchistan consists of long narrow valleys bounded by folded ridges crossed by deep gorges.

The North-eastern Hills: From the eastern edge of the Tibetan plateau many folded ridges run southward through Assam and Burma. The westernmost range goes by the name of the *Patkai* and *Lushai Hills.* It throws off a spur to the west into Assam which forms the *Jaintia, Kasi* and *Garo Hills.* Southwards the range is a narrow wall known as the *Arakan Yoma*, which reaches the coast at Cape Negrais, but is continued in the *Andamans* and *Nicobars*, and farther south in Sumatra and Java.

Burma consists of long parallel ridges running north to south enclosing valleys opening to the south. The easternmost ridge runs southward as the *Tenasserim Yoma* and continues right through the Malay peninsula. The passes in the mountain wall which separates India from Burma are very little used. People generally go to Burma by sea. The *An pass* in the Arakan Yoma lies behind Akyab.

(2) **The Plains:** The *Great Plain of Hindustan* includes the basins of the *Indus*, the *Ganges* and the lower *Brahmaputra*. It extends from the Arabian sea in the Indus

delta and the flat coasts of the Ranns and Gulf of Cutch to the Bay of Bengal in the delta of the Ganges. It is a vast alluvial plain having neither boulders nor pebbles, formed by the mud and soil washed down from the Himalayas and their off-shoots by the great rivers and their tributaries for thousands of years. This plain which nowhere, even between the Jumna and the Sutlej, exceeds 900 feet in elevation, contains more than one-third the area of India. Most of the large towns and two-thirds of the population of the country are to be found here. The soil is 500 to 1,000 feet deep and very fertile. Therefore it is highly productive and supports a dense population. The plain is flat so that the rivers flow very slowly. Hence they are useful for irrigation and navigation. Roads, railways and canals can be easily constructed. The Ganges plain is more fertile than the Indus plain and so has many more towns and people. This is also because the Ganges basin receives more rain than that of the Indus. A large part of the western half of the plain is taken up by the Thar and Sind desert.

(3) **The Plateau :** This includes the Table-land of the Deccan and that of Central India. The Deccan (*Dakshanam*=South) is the larger of the two, triangular in shape, and buttressed by the Vindhyas and Satpuras in the north, the Western Ghats on the west and the Eastern Ghats on the east. The surface of the plateau slopes down to the east so that all the rivers of the plateau except the *Narbada* and the *Tapti* flow eastward into the Bay of Bengal. The plateau is a remnant of the ancient southern continent of *Gondwanaland*, and the Western and Eastern Ghats are not fold mountains like those of the mountain wall in the north, but they are simply the edges of the plateau. The table-land is not alluvial like the plains, but consists of hard rocks covered with thin soil except in the river

valleys. Nor is it flat like the plains, but crossed here and there by low ranges of mountains. There is not as much room for cultivation as in the plains and hence the population is not so dense as there. Rivers flow over rocky beds and canals are difficult to dig. Hence the rivers are not useful either for navigation or irrigation except in the delta course. Roads and railways cannot be so easily made as in the plains. The plateau, as a whole, is higher in the south (in Mysore) than in the north.

*The Western Ghats** with an average elevation of 3,000 feet, run close to the west coast almost without a break from the Gulf of Cambay to Cape Comorin. The chief passes in the Ghats are :—(1) the *Thal Ghat,* north-east of Bombay ; (2) the *Bhor Ghat,* south-east of Bombay ; (3) *the Gap near Dharwar* opposite to Goa ; and (4) the *Palghat Gap* (20 miles wide, 1,000 ft. high) south of the Nilgiri Hills where the ghats reach an elevation of over 8,000 feet. (*Dodabetta* the highest peak of the Nilgiris is 8,640 feet high.) All these passes are crossed by railway lines which connect the coastal towns with the interior. South of the Palghat gap, the ghats are known as the *Anamalai* and *Cardamon Hills.* This latter is crossed by a railway line connecting Shencottah and Quilon.

The Eastern Ghats running parallel to the east-coast are of lower elevation than the Western Ghats, and are broken through by the rivers flowing into the Bay of Bengal. They are called by different names in different places and meet the Western Ghats in the Nilgiri Hills.

In the north a line of mountains runs across the plateau from west to east. These mountains are the

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* "Ghat" means "pass" as well as "landing steps". The name was applied first to the passes in the mountains and then to the mountains themselves.

Vindhyas and the *Satpura Range*, continued eastwards as the *Mahadeo Hills* and *Maikal Range.*

The table-land of Central India or Malwa lies north of the Vindhya Range and slopes northwards towards the Jumna-Ganges valley. It extends westward to the *Aravalli Hills. Mount Abu*, the highest portion of the Aravallis, is 5,650 feet high.

(4) **The Coast-Strips:** The west coast-strip between the Western Ghats and the Arabian Sea is a narrow lowland, about 20 to 40 miles broad. It extends from the head of the Gulf of Cambay to Cape Comorin and is crossed by several short rivers.

The northern half is known as the *Konkan Coast,* and the southern half as the *Malabar Coast.*

The east coast-strip lying between the Eastern Ghats and the Bay of Bengal extends from the delta of the Ganges to Cape Comorin. It is much broader than that on the west coast, especially in the south. Here it is called the *Carnatic Plain* and the coast is known as the *Coromandel coast.* The eastern strip contains the fertile deltas of the *Mahanadi*, the *Godavari*, the *Krishna* and the *Cauvery.* The soil is alluvial like that of the northern plains.

RIVERS

The rivers of the plain of Hindustan all rise in the mountain wall in the north or beyond it. The mountains here are covered with ever-lasting snow so that the rivers of North India are fed with water from the gradual melting of the snow, especially in the warm season. Thus these rivers do not depend entirely on the monsoon rains, and as such they are never dry.

The rivers of Peninsular India are quite different from those of Northern India. They rise in the hills of the plateau and are fed only by the monsoon rains. So in the dry season they often become almost dry.

The Rivers of North India: The *Ganges* (1,550 miles) (Fig. 4) is the most important river in India. With its great tributaries, the *Jumna* on the right, and the *Gogra*, the *Gandak*, and the *Kosi* on the left, it drains the southern slopes of the Himalayas east of Simla. It rises in the *Gangotri* glacier and leaves the mountains at *Hardwar*. It flows south-east and is joined by the Jumna at *Allahabad* (*Prayag*). Then the river flows eastward through one of the most fertile plains in the world, turns round the Rajmahal Hills, and finally flows south-east into the Bay of Bengal. It builds a great delta between the main stream and its chief branch, the *Hooghly*. This delta unites with those of the Brahmaputra and the Meghna. The united delta has a sea-face of over 200 miles; it is intersected by numerous creeks and channels which break it up into a number of flat mud islands, which are overgrown with jungles and forests known as the *Sundarbans*. The Ganges is a great fertiliser and a highway of commerce. The Jumna receives the *Chambal* and other rivers draining the northern slopes of the Vindhya Range.

The *Brahmaputra*, the *Sanpo* of Tibet, rises not far from the sources of the Indus and the Sutlej. It flows eastward along a trough in the plateau of Tibet, and after a sharp turn round the eastern end of the Himalayas, it enters India. It runs nearly west through Assam, and curving round the Garo Hills, it flows south joining the Ganges at *Goalundo*. The river is navigable up to *Dibrugarh*.

The *Indus* (1,800 miles) (Fig. 5) rises near *Mt. Kailas* not far from the sources of the Sutlej and the Sanpo, nearly 17,000 feet above sea-level. It flows north-west till it bends round Nanga Parbat and then it turns nearly south. Here it breaks through a gorge with cliffs nearly 14,000 feet high on either side. The *Sutlej*, rising in the sacred *Rakas Tal Lake* not far from the source of the Indus, flows through gorges across the Himalayas and the Siwaliks. It runs south-westward to join the Indus. Within the triangle formed by the two river courses lie the four other left hand tributaries of the Indus—the *Jhelum*, the *Chenab*, the *Ravi* and the *Beas*. These four rivers and the Sutlej unite before joining the Indus and the united waters are known as the *Panjnad*. The country through which these five rivers flow is known as *the Punjab* (*Panj ab*=five rivers). On the right hand side the Indus receives small, rapid, snow-fed mountain rivers like the *Gilgit*, the *Kabul*, the *Kurram* and the *Gomal*, which form routes to Afghanistan. Like the Nile, the Indus flows through a rainless region in its lower course. So it receives no tributaries and its volume decreases. Contrast the Indus with the Ganges. The Indus often shifts its banks, especially in its lower course where its bed is raised; hence it is not so very useful to navigation as the Ganges. But the river and its left hand tributaries are very much used for irrigation. The Jhelum is the river of the happy Vale of Kashmir..

The Himalayas are not a true water-parting as many of the rivers rising in the Tibetan plateau cut through them and flow to the plains in the south.

The Rivers of the Deccan Table-land: The rivers in order from north to south are the *Mahanadi*, *Godavari*, *Krishna*, *North Pennar*, *Palar*, *South Pennar*, *Cauvery*, *Vaigai* and *Tambraparni*. All the rivers flow eastward into the Bay of Bengal. There is sudden rise of water after the monsoon rains, but all of them quickly dry up.

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They flow over rocky beds and through gorges. Therefore they are of little use for navigation. All the rivers build fertile deltas which are well irrigated. The Tambraparni, though a very small river, is important as a great source of irrigation. The Godavari, the Krishna and its tributaries, the *Bhima* and the *Tungabadra*, rise in the Western Ghats almost within sight of the Arabian Sea.

Two of the rivers of the table-land the *Narbada* and the *Tapti* flow westward into the Arabian Sea. They are confined to narrow valleys, and so their courses are straight and they receive no large tributaries. Unlike the other rivers of India, they have no deltas. They are navigable by small ships for about 100 miles up their course. The *Sabarmati* drains the western end of the Malwa plateau and flows into the northern end of the Gulf of Cambay.

On the western side of the Western Ghats there is no room for any large river, as they run close to the coast. The streams are therefore short and swift. Of these the *Shiravati* is the best known on account of its *Gersoppa Falls*, the chief of which is about 830 ft. high.

The Rivers of Burma : The chief rivers are *Irrawaddy*, the *Sittang* and the *Salwin*. All these flow north to south through narrow valleys between mountains. Hence they have few tributaries ; but Irrawaddy has a tributary, the *Chindwin*. All these rivers flow through a region of heavy rainfall : therefore they never run dry, and are full and deep for many months in the year. The Irrawaddy is the most important of the rivers of Burma, for it is navigable for three-fourths of its length (900 miles from the sea, to beyond Bhamo), while the Sittang is blocked by sand banks and the Salwin flows through mountains up to near its mouth. The Irrawaddy builds a delta like that of the Ganges.

The Rivers of Baluchistan : Baluchistan is a dry country with a rainfall never exceeding 8 inches in the year. There are only short streams which flow after rain and empty into shallow lakes which often dry up entirely in the hot weather.

SOILS AND MINERALS

Soils (Fig. 6): Generally speaking, the main geological features of a country have a close correspondence with the physical features. Folded rocks of all ages form mountains,

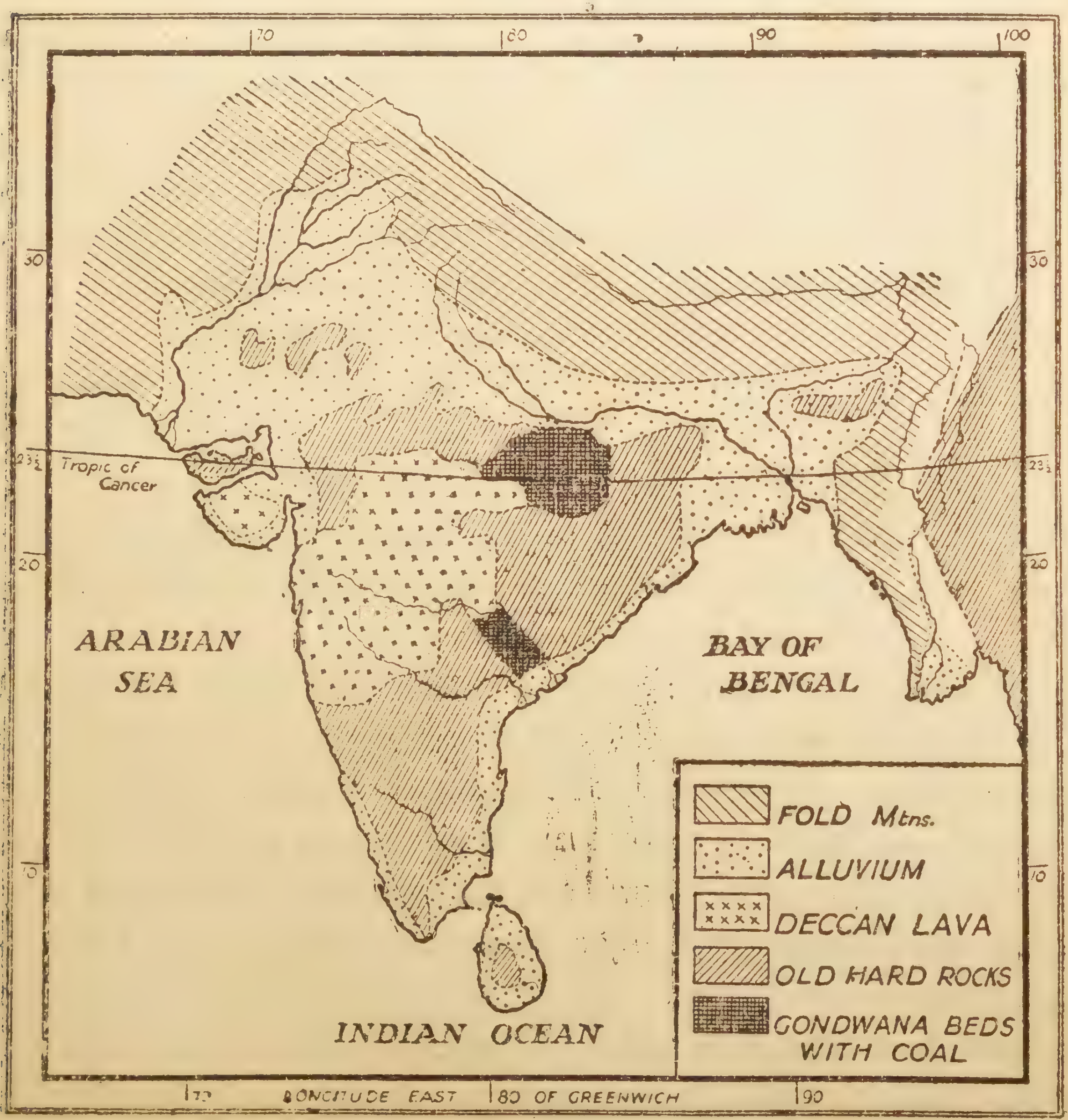


FIG. 6. SOILS OF INDIA

ancient crystalline rocks form plateaus, and alluvial deposits, plains. The mountain walls of India consist of folded sedimentary rocks. The plain of Hindustan and most of the coastal strips consist of alluvium. The Deccan plateau consists mainly of very old crystalline rocks. This plateau is a *crust-block* (Fig. 4 Africa) which existed long before the Himalayan fold was formed. In the north-eastern part of the plateau and in the Godavari valley there are coal-bearing beds (marked *Gondwana beds* in the figure) which are old sedimentary rocks.

Nearly the whole of the north-west of the plateau including the Kathiawar Peninsula has been covered by great sheets of lava, known as the *Deccan trap.* The surface of this lava area, one of the largest in the world, has been broken up into a dark soil which contains a good deal of iron and is capable of retaining moisture.

Thus in India there are three kinds of soil:

(1) the alluvial soil of the plains where a variety of crops can be grown ;
(2) the volcanic soil of the Deccan trap area or the black cotton soil where cotton is largely grown ;
and (3) the soil of the crystalline tract which is often thin and generally poor.

Minerals (Fig. 7): Many valuable minerals are found in the old crystalline rocks of the plateau. *Gold* is worked in the Kolar Goldfields of Mysore. *Copper* is found in Bihar and Orissa and also at many places in the Himalayas ; but little is mined. *Tin* is found in large quantities near *Tavoy* and *Mergui* in Lower Burma and also in the Hazaribagh District of Behar. Large deposits of *silver* and *lead* are found at *Bawdwin* in the North Shan States of Burma. India takes second place among *Manganese* producing countries, the chief areas of production being the Central

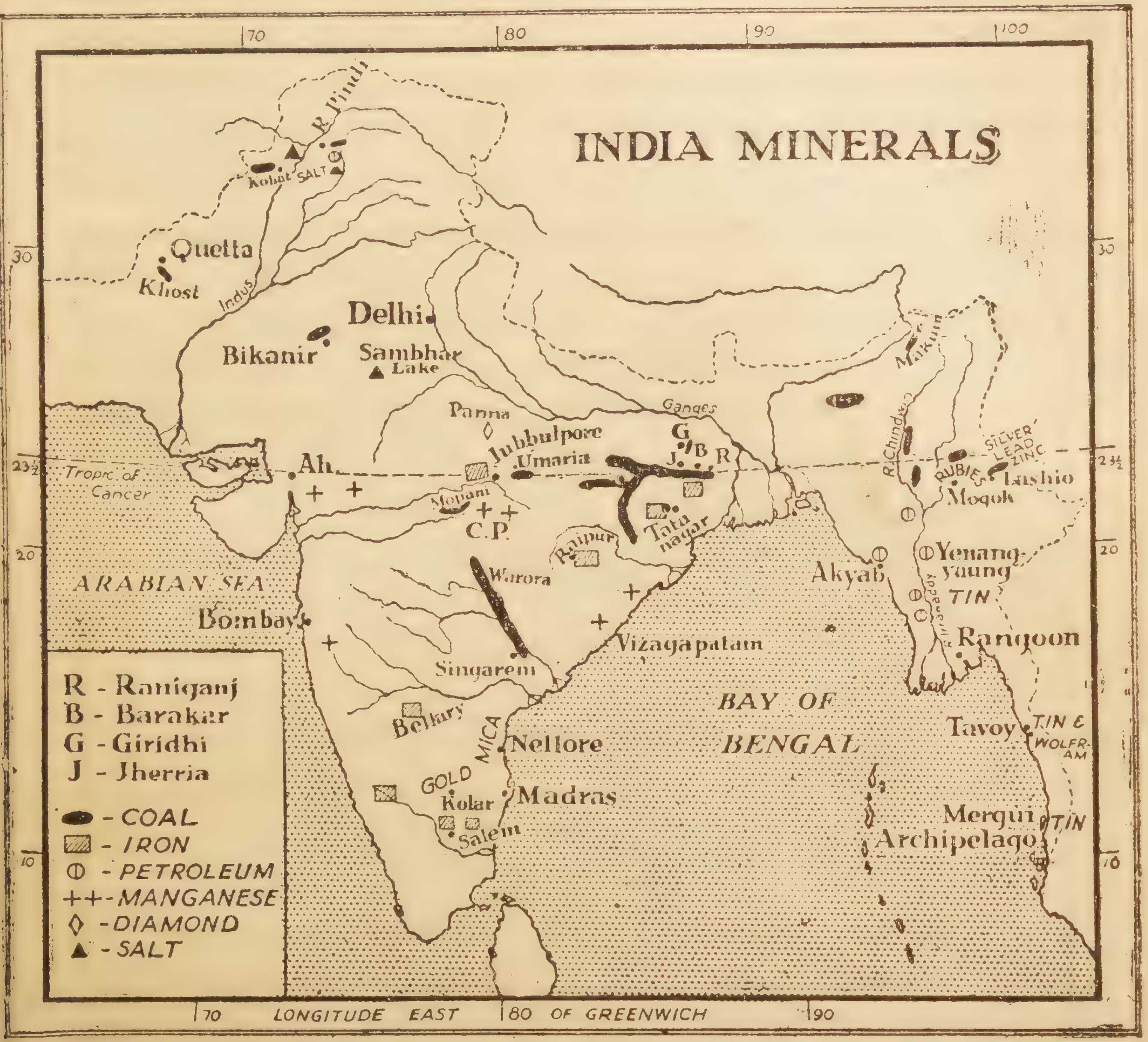


FIG. 7. MINERAL RESOURCES OF INDIA.

Provinces (Nagpur District), Bombay and Madras (near Vizagapatam). More than half of the world's supply of *mica* is obtained from Bengal and the *Nellore* District of Madras. *Rubies* are mined near *Mogok* in Upper Burma. Some *diamond* is found near *Panna* in Central India. *Wolfram*, used in making steel, comes largely from *Tavoy* in Burma.

More important than all these is *coal*. Small coal-fields have been discovered in Burma (*Chindwin Valley*), Assam (*Makum*), Rajputana (*Bikaner*) and Baluchistan

(*Khost*). Larger ones are met with in the *Damodar Valley* in Bengal and Orissa, near *Umaria* in Central India, at *Mopani* and *Warora* (Wardha Valley) in the Central Provinces and at *Singareni* in Hyderabad.

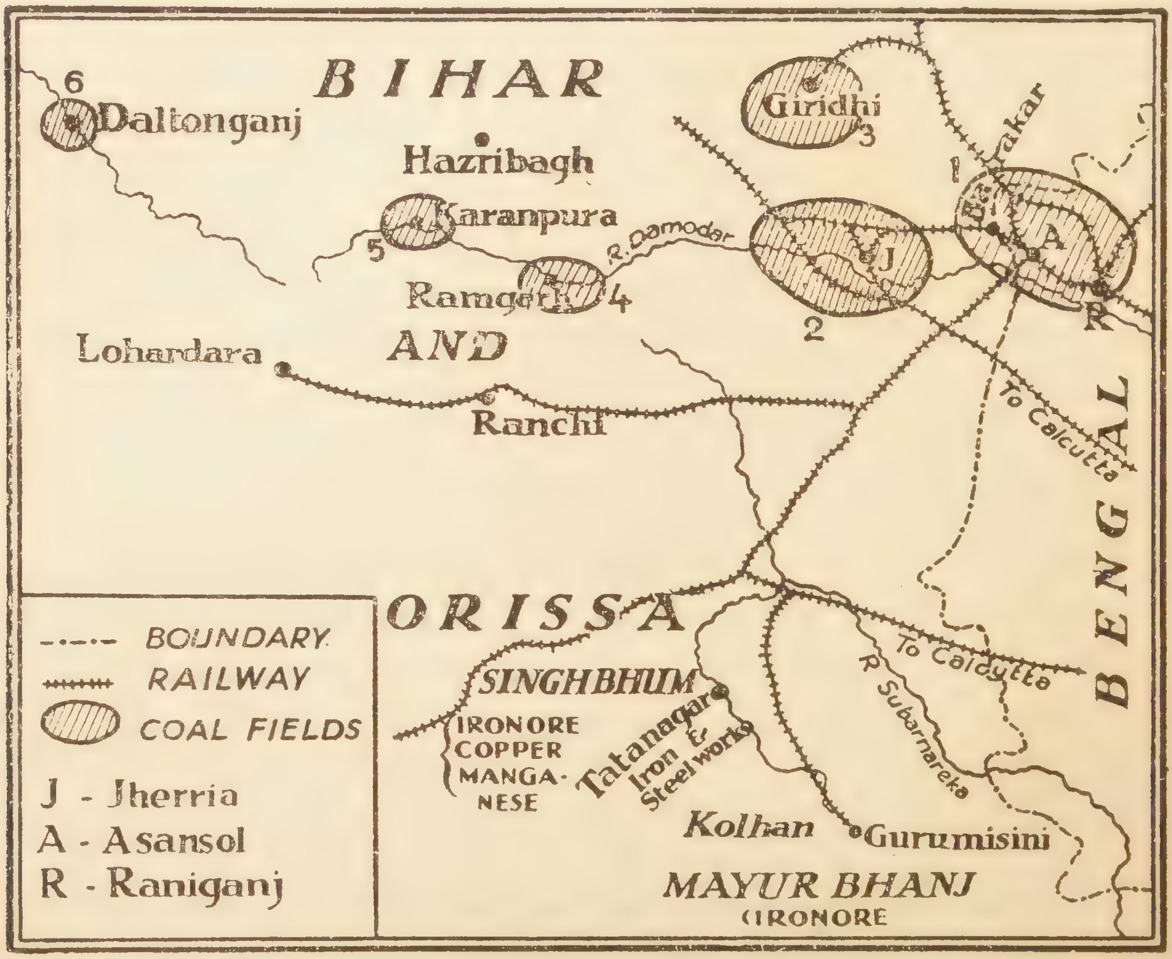


FIG. 8 THE COALFIELDS OF THE DAMODHAR VALLEY AND THE NEIGHBOURING IRON FIELDS

Over 90 per cent of the total output of India is obtained from the coal-fields of Bengal, Bihar and Orissa (Fig. 8). The chief centres are *Raniganj*, *Asansol*, *Jherria* and *Giridhi*. Coal is also mined at *Ramgarh*, *Karanpura* and *Daltonganj*. *Iron ore* of excellent quality is found near *Salem* (Madras Presidency) and in Orissa. In the former it is not now worked for there is no coal near the field; but in the latter it is worked in the *Mayurbhanj* and *Singbhum* districts (Fig. 8). In the latter area limestone, which is required for smelting the ore, and manganese, which is used in hardening steel, are also found. The Tata Iron and Steel Works at *Tatanagar* (Jamshedpur) owe their existence to the presence of these minerals. At *Barakar* ironworks were started because iron ore was found along with coal ; but local ore is no longer used. The blast furnaces and foundry near the town use iron ore from *Kolhan* (Orissa).

Petroleum is worked in the Punjab near Rawalpindi, but more important stores of this useful mineral oil are found in Burma on the eastern side of the Arakan Yoma, and in the Irrawaddy valley in which lies the well-known field of *Yenangyaung*. There are also a few wells in the Brahmaputra valley in Assam.

Salt is obtained (1) by evaporation from sea-water at places along the coasts of Bombay and Madras ; (2) from the salt lakes of Rajputana ; (3) in the form of rock salt quarried in the Salt Range of the Punjab. Large quantities of foreign salt are also imported into the country every year.

EXERCISES

(1) With the help of an upright stick measure the midday altitude of the sun in your place on the 21st June, and then find the latitude of your place.

(2) A steamer enters Bombay harbour (72° 54' E. Long.) when her chronometer shows 1 hr. 8 min. 24 sec. What time is it at Bombay ?

(3) Find the difference between the 'standard time' and the local time of your town.

(4) Why does the entrance of the harbour of Madras face north?

(5) How are the backwaters of the Malabar coast formed? What is their importance ?

(6) Draw a sketch map of the north-west frontier of India showing the chief passes.

(7) Why are Kabul and Quetta said to be the keys of the north-western gates of India ?

(8) Contrast the northern plain with the southern plateau of India as regards the surface feature and soil.

(9) Bring out as many points of contrast as you can between (i) the Indus and the Ganges; (ii) the rivers of Northern India and those of the southern plateau.

(10) Mention the chief gaps in the Western Ghats and show their importance.

(11) With reference to India point out the connection between geological structure and physical features.

(12) (i) What minerals are found in the following places:—Kolar, Nellore, Salem, Tavoy, Bawdwin, Vizagapatam and Singareni?

(ii) Draw a sketch map of the Chota Nagpur plateau showing the chief mining centres.

CHAPTER II

THE CLIMATE OF INDIA AND IRRIGATION

TEMPERATURE

You have seen that the Tropic of Cancer passes right through the middle of the country about 1° north of Calcutta. So the major part of the country lies within the

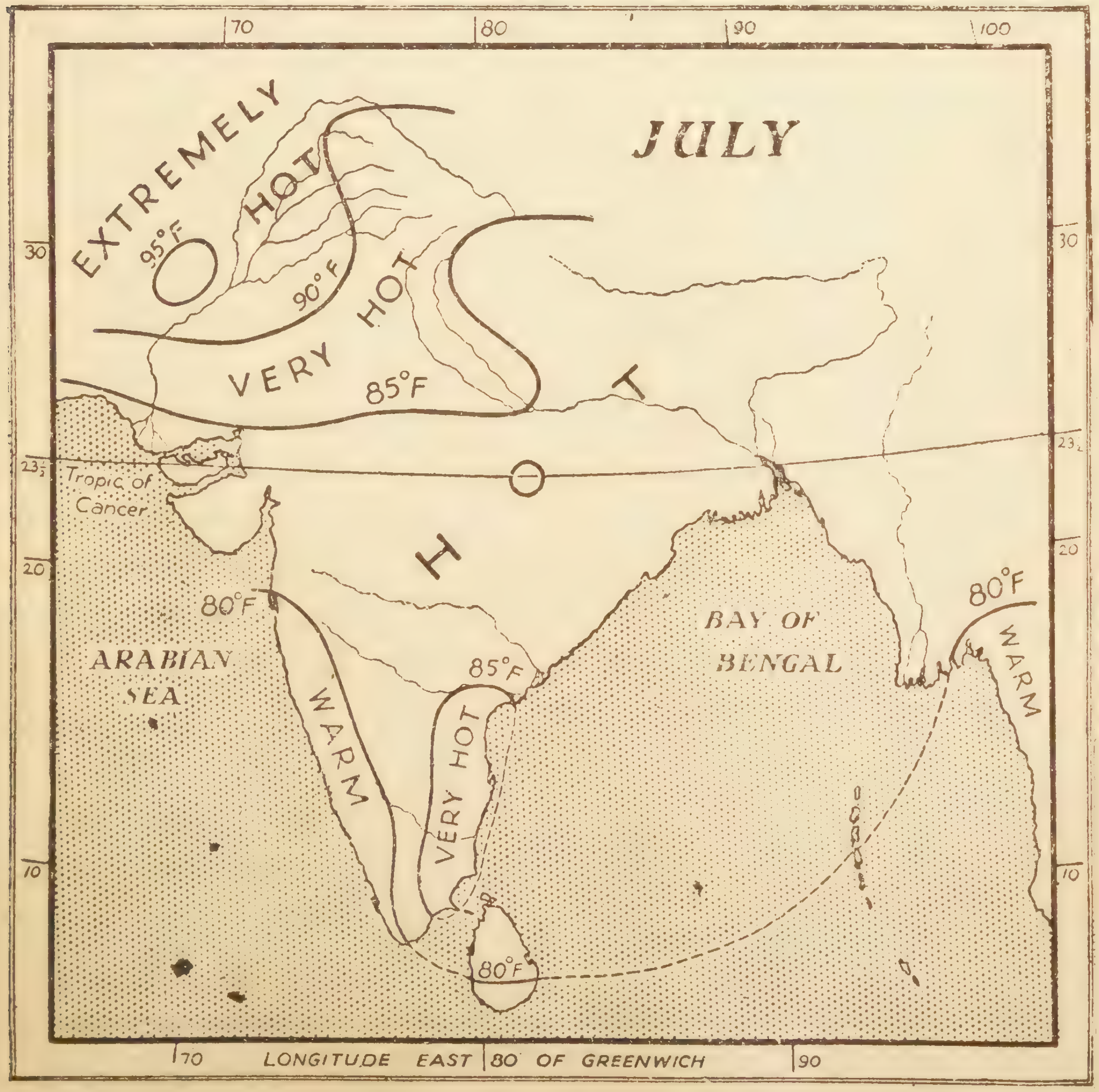


FIG. 9. INDIA: JULY TEMPERATURE.

Torrid Zone, and consequently India is a hot country. The *average* temperature decreases from south to north; *e. g.*, Madras, 82°F; Bombay, 80° F; Allahabad, 76°F; Lahore, 73°F.

But look at the summer (July) isotherm map (Fig. 9); you will find the temperature increasing northward, *e. g.*, Colombo, 82·1° F; Nagpur, 88·6° F; Allahabad, 92·5° F. (temperatures for the hottest month.) In March when the sun is near the equator the hot weather begins. In April and May the sun's rays fall vertically over the plateau, and northern Deccan becomes the area of greatest heat. In June the sun is overhead at the Tropic of Cancer, *i.e.*, on the northern plains, so that the area of greatest heat is shifted from Central India to the north-west. The increase of temperature over the northern plain in June and July is due not only to the vertical rays of the sun, but also to the long duration of daylight. As these months are generally months of rainfall, the temperature of almost all the places in the northern plains

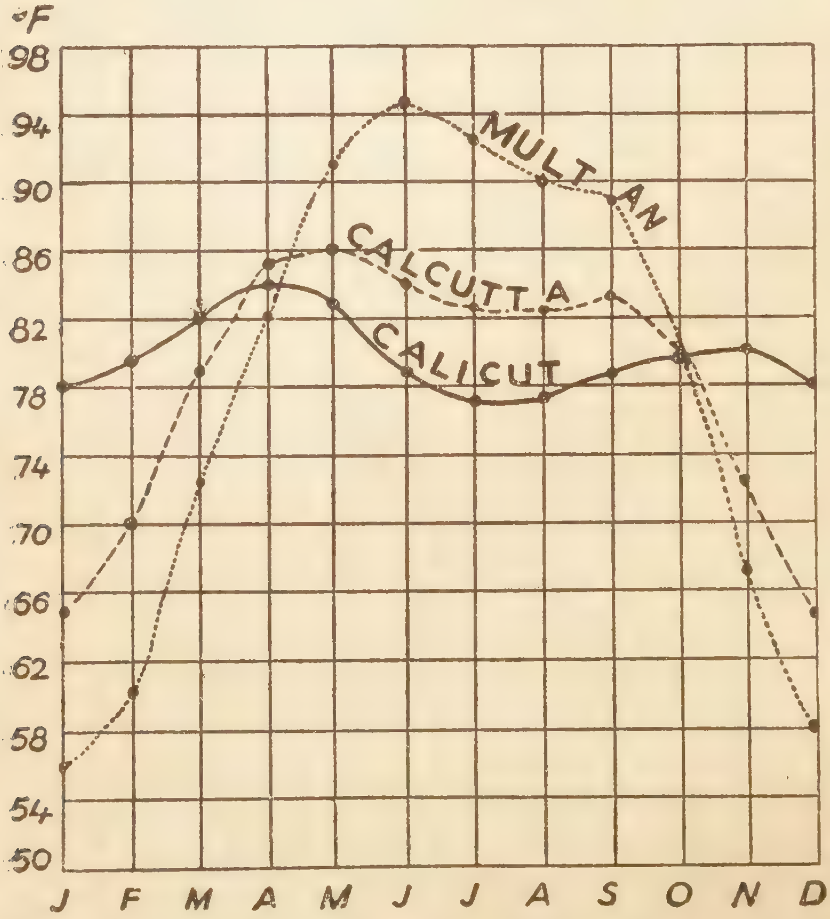


FIG. 10. Mean temperatures of Calicut (S. India, coast), Calcutta (N. India, coast) and Multan (N. India, Interior). Compare the range of Calicut and Multan. Note the fall in temperature with the setting in of the South-West Monsoon.

is higher in May. On an average day in May the thermometer will exceed 105° F; and occasionally the temperature may even go up to 120°. In north-western India where the rainfall is least, the temperature is highest in June. Study Fig. 10 showing the temperature graphs of three places. Compare Calcutta and Multan. Over arid Sind the temperature is by far the highest in all India. Jacobabad in Upper Sind, situated near the Thar Desert, is one of the hottest stations in India, its mean June temperature being 97·7° F. But day tempe-

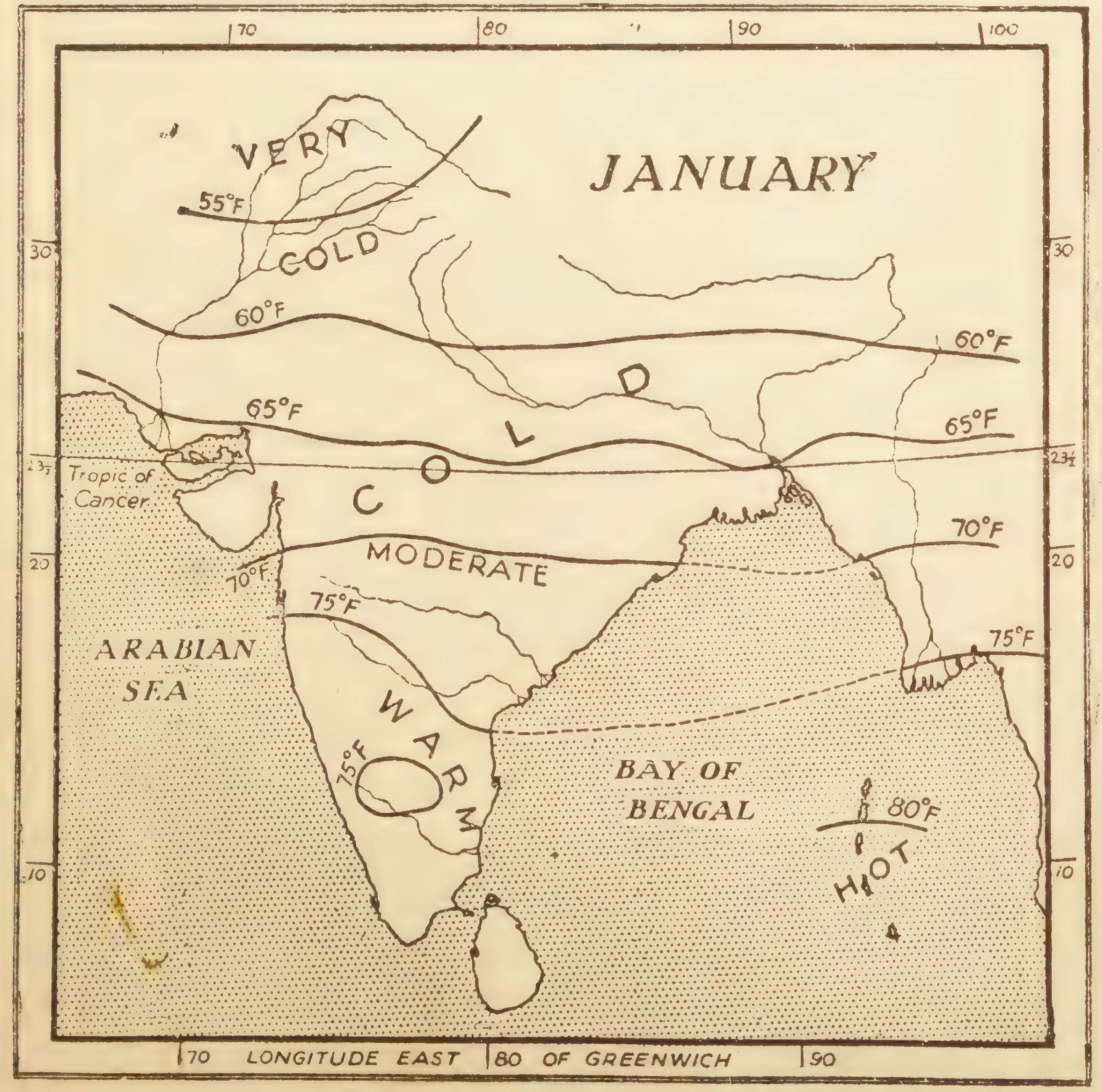
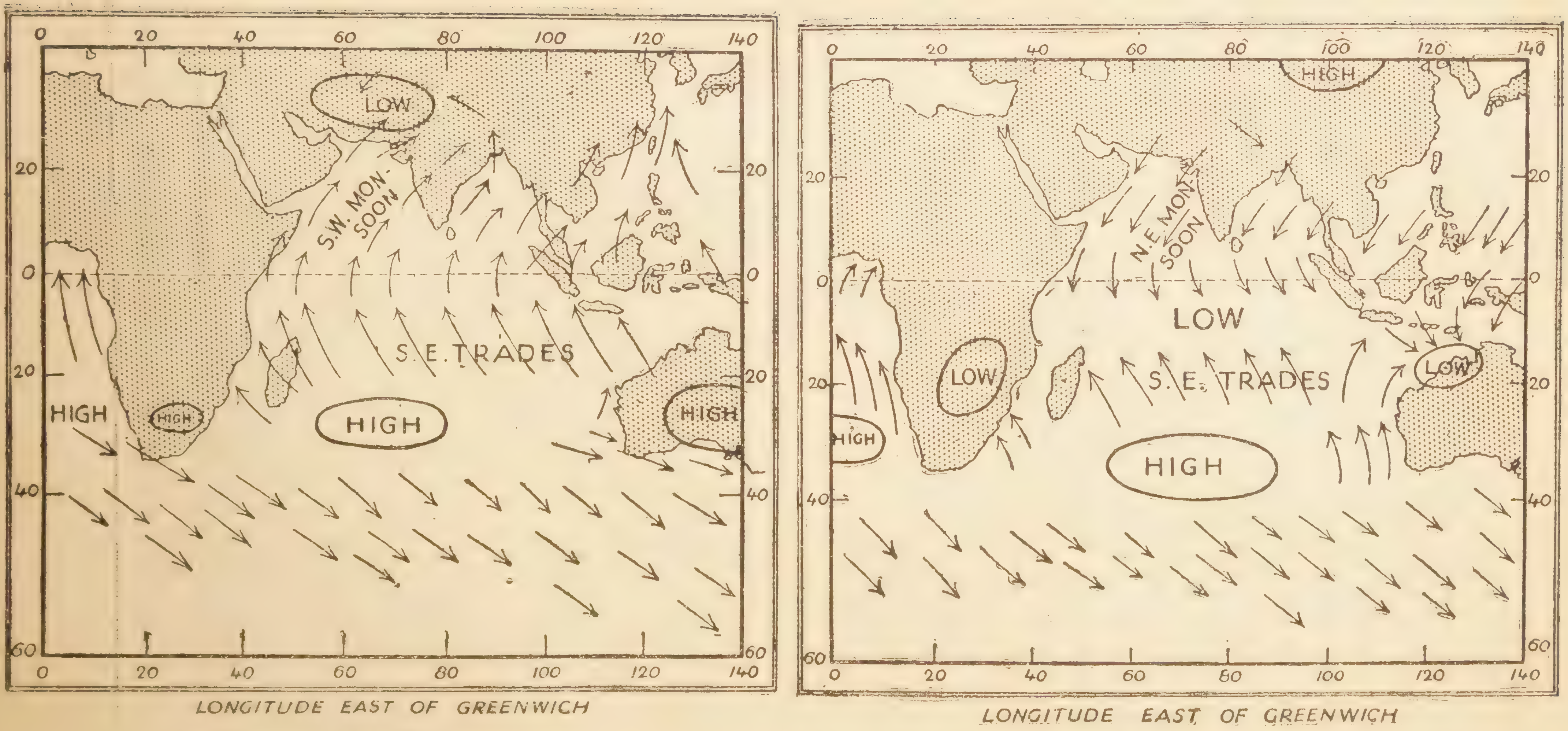


FIG. 11. INDIA: JANUARY TEMPERATURE



(*a*) July

(*b*) January

Fig. 12 Pressure and Winds of the Indian Ocean Basin

ratures ranging from 117° to 126° F have been recorded. Night temperatures range from 75° to 80° F.

In the cold season (Fig. 11, January isotherm map) the sun is shining vertically over places near the Tropic of Capricorn, and naturally, therefore, the temperature decreases from south to north; *e. g.*, Colombo, 79° F; Nagpur, 69·8° F; Allahabad, 59·5° F; Lahore, 53° F.

Both daily and annual ranges of temperature are high in places which are a long way from the sea, especially in the dry regions. On the Konkan and Malabar coasts the daily range averages 10° F; while in the Punjab and Upper Sind it is 30° F. The following figures illustrate the fact that the annual range of temperature increases from the sea to the interior:

Towns	Hottest month	Coolest month	Range
Calcutta ...	85·7° F	65·2° F	20·5° F
Patna ...	88·0° ,,	50·8° ,,	27·2° ,,
Benares ...	91·3° ,,	60·0° ,,	31·3° ,,
Delhi ...	92·2° ,,	57·9° ,,	34·3° ,,
Lahore ...	93·0° ,,	53·0° ,,	40·0° ,,

Again the range of temperature is much less in the south than in the north, *e. g.*, Colombo, 3·1° F; Calicut, 6·9° F; Bombay, 10·1° F; Calcutta, 20·5° F. Compare the ranges of temperature of the places given in the graph (Fig. 10). Temperature is affected by altitude also. Compare the mean monthly temperature (°F) of Madras (22 feet) and Bangalore (3,021 feet above sea-level)

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Madras	75·3	76·6	79·5	84·1	88·7	88·4	85·7	84·5	83·9	80·8	77·9	75·7	81·8
Bangalore	67·5	72·0	76·7	79·9	78·5	74·0	72·0	71·8	71·8	71·8	69·6	67·5	72·8

PRESSURE AND WIND

You have already learnt that India is a part of the Monsoon Lands of Asia. Fig. 12 (a) shows the distribution of low and high pressure centres in the Indian Ocean Basin in July. As early as the end of May there is a definite centre of low pressure over Sind and Baluchistan. From the tropical high-pressure belt of the South Indian Ocean, the south-east trades are drawn in towards this low-pressure centre. As these winds cross the equator, they come under the influence of the rotational deflection of the northern hemisphere

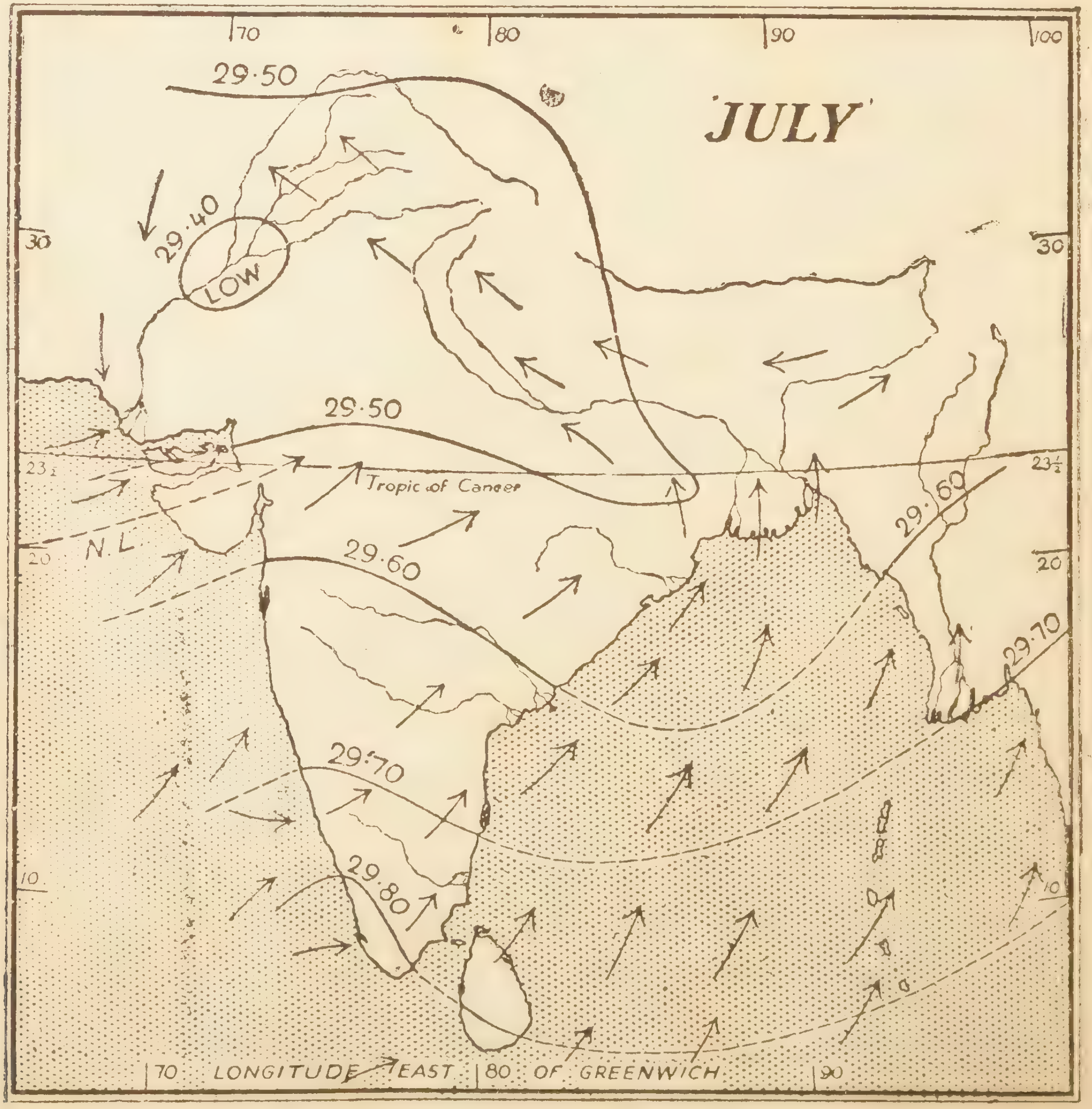


FIG. 13. INDIA: PRESSURE AND WIND (JULY)

and become south-west winds. These winds sweep over India as the *South-west Monsoon.* This monsoon blows over India as a fairly steady wind of considerable strength. At Bombay its average speed is about 20 miles per hour. This wind does not however blow everywhere from the south-west. Study Fig. 13 showing July isobars and winds of India. Note that in the northern plains the winds blow from south-east to north-west. Why ?

Fig. 11 (b) shows the distribution of pressure and winds in the Indian Ocean Basin in January. The low pressure

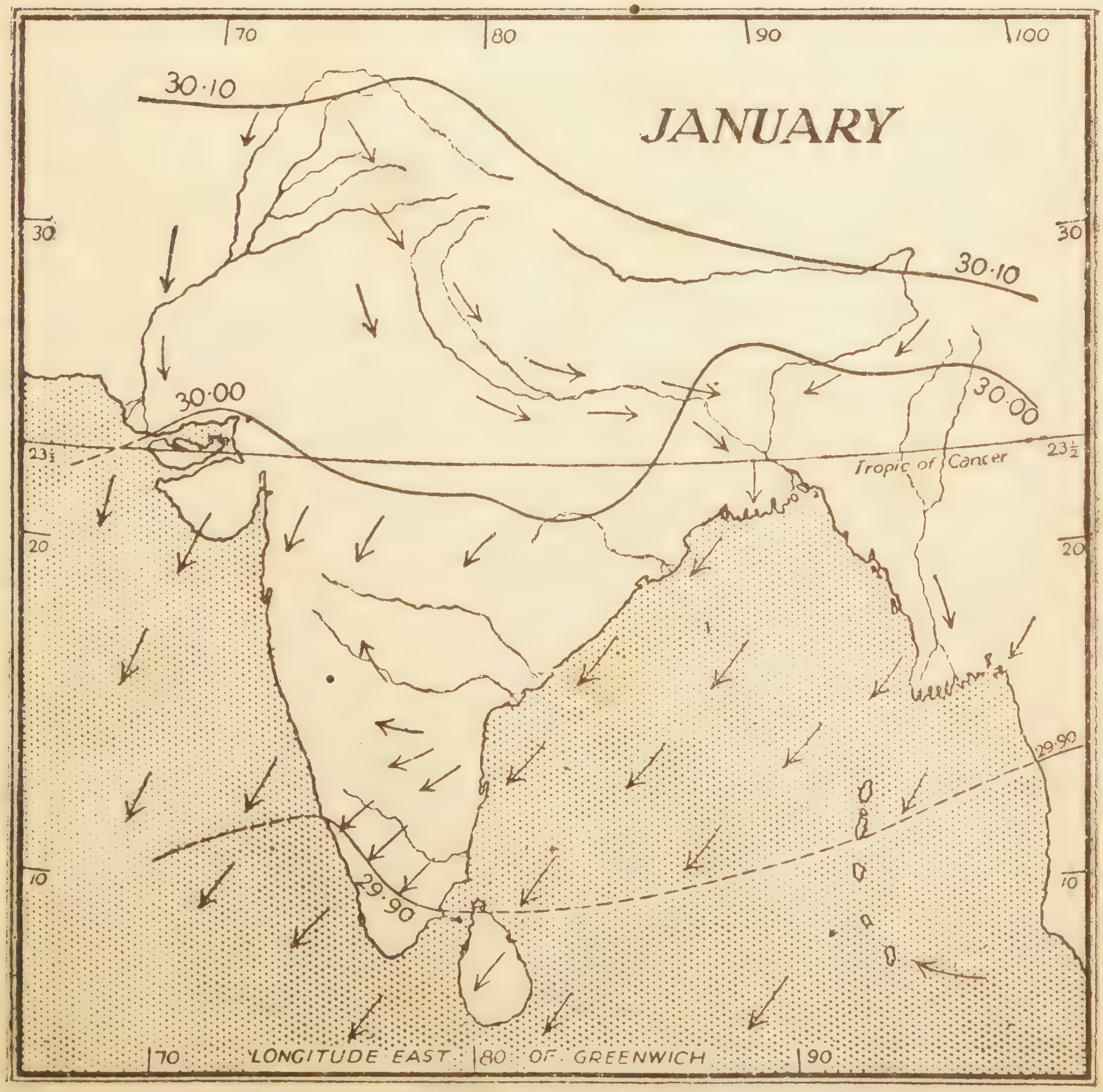


FIG. 14. INDIA : PRESSURE AND WINDS (JANUARY)

belt lies near the equator; the north-east and south-east trades blow towards the equator.

India lies in the belt of the north-east trades. These actually blow in India from about the end of October to February or March and they are usually referred to as the *North-east Monsoon.* Fig. 14 shows the pressure and winds of India in January. Note that in the northern plains the winds blow from north-west to the south-east coast.

RAINFALL

South-west Monsoon (Fig. 15): The South-west

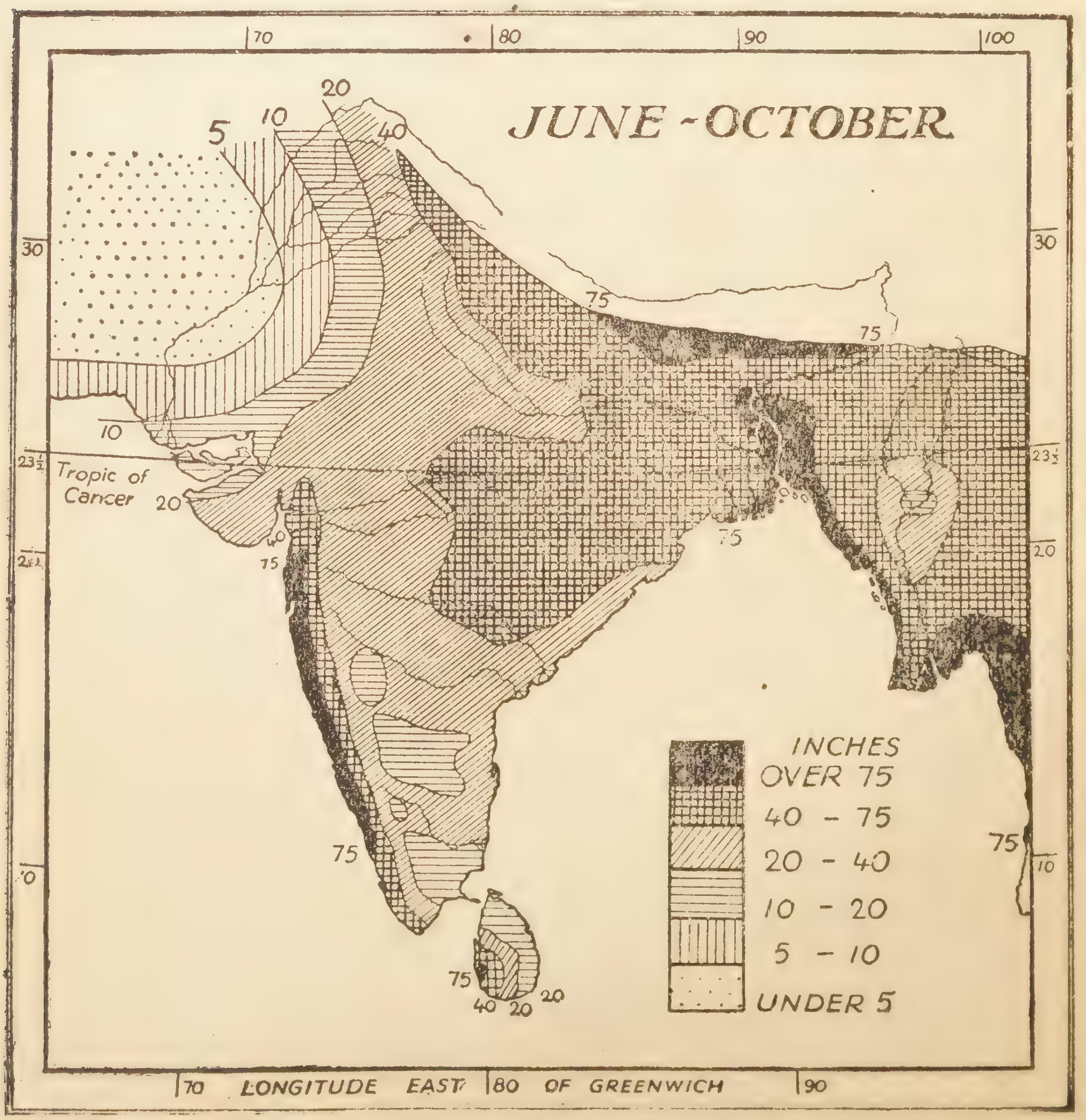


FIG. 15. INDIA: MEAN RAINFALL DURING S. W. MONSOON

Monsoon is the chief rain-giver of India and the source of livelihood to its millions of inhabitants. It is estimated that 85 per cent of the total rainfall of the country is derived from it. But we should not think that it rains continuously. There are breaks which, if prolonged, may bring about failure of crops.

The south-west monsoon reaches the coast of India about the end of May and the Monsoon 'bursts' about the middle of June. Rain falls from June to October which is the wet season for the whole of India. Fig. 13 shows the main wind direction round India. There are two well-marked air-currents, one meeting the Western Ghats at right angles, and the other advancing over the Bay of Bengal and then blowing north-west up the Ganges Valley. The rains are associated with passage of cyclonic depressions or storms from the head of the Bay of Bengal in a westerly direction towards the interior. Fig. 15 also illustrates the effect of the relief of the land on the rainfall.

The Arabian Sea branch of the Monsoon strikes the Western Ghats and gives heavy rainfall to the coastal districts and the western face of the Ghats where the average is about 100 inches. Then it crosses the peninsula giving strong winds and occasional rain to the Deccan, where the average ranges from 40 to 20 inches. Bombay has 71 inches * in June, July, August and September, while Poona, in the rainshadow east of the Ghats, has 20·7 inches. Mangalore (west coast) has 109 inches, Bangalore (interior) 20 inches, and Madras (east coast) 15 inches. Study the rainfall graphs (S. India, Fig. 16).

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* All the rainfall figures mentioned in the paragraphs under South-west Monsoon are the total for the months of June, July, August and September.

Most of the centre and east of the Deccan receives between 15 and 30 inches.

The northern portion of the Arabian Sea branch runs between the Vindhyas and the Satpuras, and getting farther inland, gives rain to these hills as well as those that continue them. North Kathiawar forms the northern limit of the rain-bearing south-west monsoon. In Kathiawar and Cutch, the wind, finding no obstruction, passes over the sandy plains of Western Rajputana, giving little rain until it reaches the Aravallis. Here there is more rain than on the plains, *Mt. Abu* getting 60 inches. Then the wind advances north-ward and unites with the Bay of Bengal branch coming up the Ganges Valley.

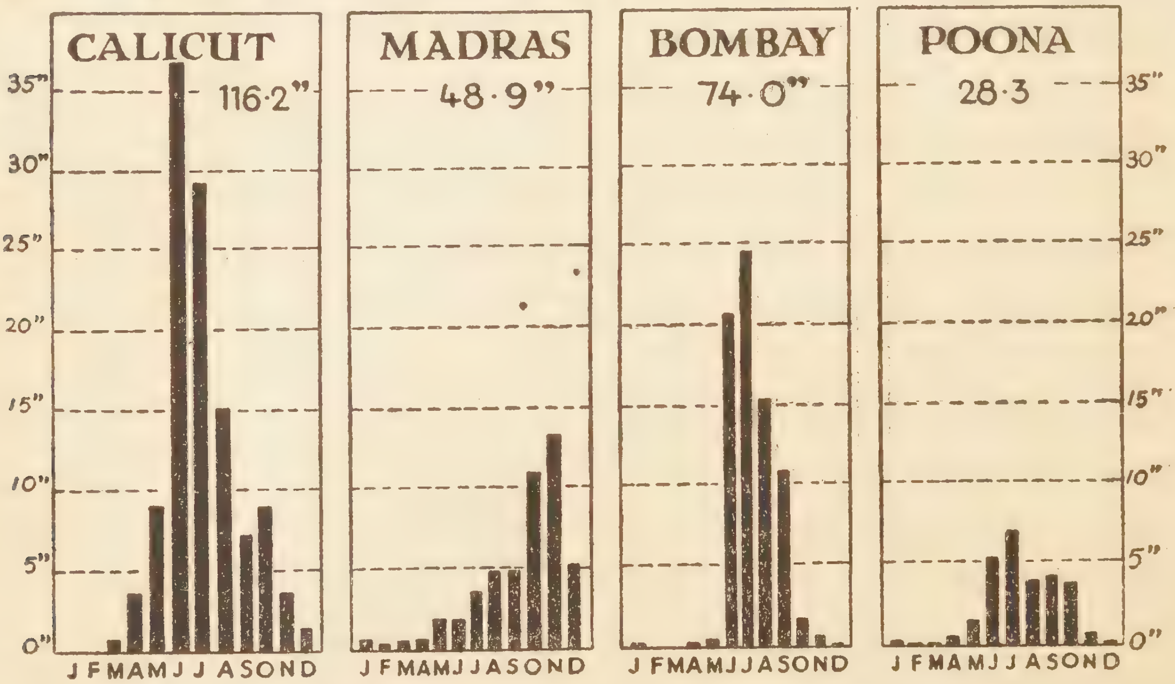

FIG. 16. TYPICAL RAIN CHARTS (SOUTHERN INDIA)
(The figures by the side of the towns represent the total for the year).

A portion of the Bay of Bengal branch of the monsoon strikes the coast of Burma and gives heavy rain to the west coast and mountains of that country, while a large part of it advances northward up the delta of the Ganges. Just as the west coast of India has heavy rainfall and the rain-shadow interior has low rainfall, the west coast of

Burma has heavy rains and the interior is comparatively dry; *e. g.*, *Akyab* on the coast has 164 inches, *Mandalay* only 19 inches. The wind going up the delta of the Ganges is forced to ascend the Assam Hills and the Eastern Himalayas. This is the region of heaviest rainfall in India, *Cherrapunji* on the southern slopes of the Kasi Hills having 344 inches (the annual mean being 458 inches). But *Shillong* on the leeward slope of the Kasi Hills has only 57 inches, and *Gauhati* in the Brahmaputra valley has 43 inches. The remainder of the current is deflected westwards up the Ganges Valley, getting weaker and weaker as it advances towards the Punjab. Here the monsoon becomes a south-east wind, and rain decreases from east to west. The following figures illustrate this :—

East	Station	Mean Rainfall June-Sept.	Province or Division.	Mean Rainfall June-Sept.
↓	Calcutta ...	46 inches	Assam ...	64·7 inches
	Patna ...	38 ,,	Bengal ...	56·3 ,,
	Allahabad ...	34 ,,	Bihar & Orissa.	43·4 ,,
	Agra ...	24 ,,	United Prov. ...	35·0 ,,
	Delhi ...	23 ,,	Rajputana ...	19·2 ,,
	Multan ...	5 ,,	Punjab ...	16·0 ,,
	Jacobabad ...	3 ,,	N. W. F. Prov.	8·5 ,,
West			Sind ...	5·5 ,,

The decrease becomes specially marked when we cross the Ganges-Indus divide and enter the Punjab. See (figure 17) the rainfall graphs for Calcutta, Delhi, and Multan.

The deserts of Sind are the most arid region in India. The Thar desert lies almost exactly in the centre of lowest pressure; for the wind coming from the east has lost its moisture during its passage up the Ganges plain. On the west the wind comes from the arid plateau of Afghanistan and Baluchistan. In the south coast of Sind the prevailing

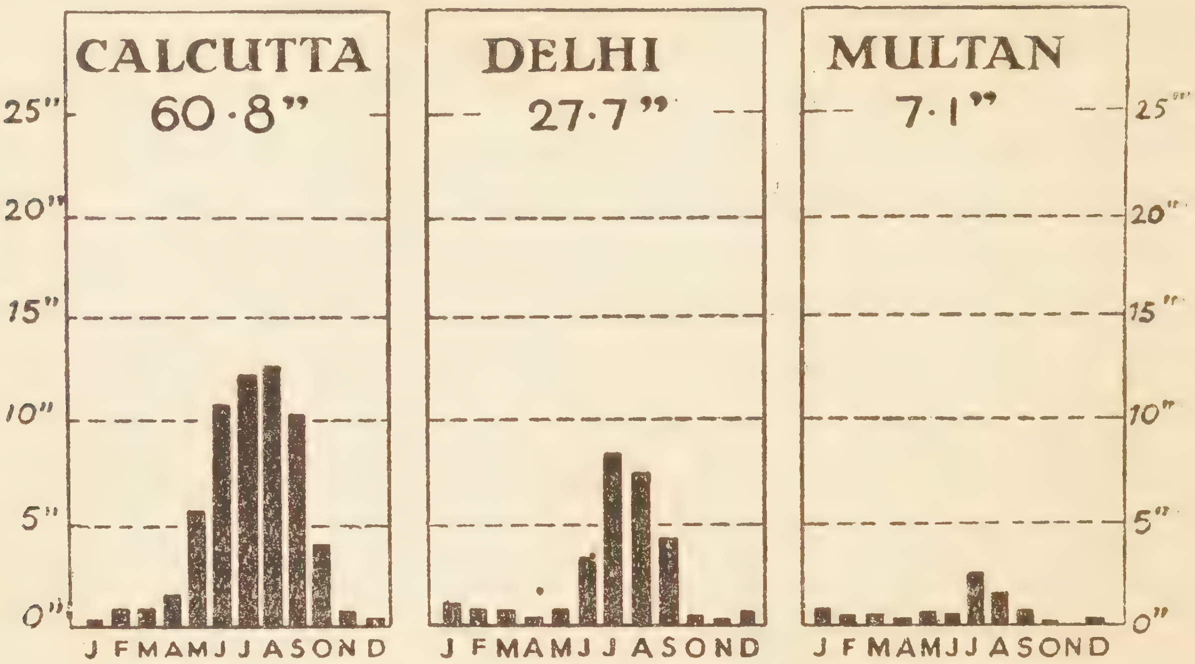

FIG. 17. TYPICAL RAIN CHARTS (NORTH INDIA)

winds are south-west and west. Though these winds can bring some moisture from the sea, the intense heat of the desert sand renders condensation impossible.

In Baluchistan the wind is off-shore, so it is very dry. The arid west, with a mean annual rainfall of less than 10 inches, includes almost all Sind, the west of Rajputana, the south-west of the Punjab, and Baluchistan.

The outer ranges of the Himalayas have very heavy rain during the monsoon which decreases from east to west e.g., Darjeeling, 100 ins.; *Naini Tal*, 79 ins.; *Simla*, 50 ins.; *Murree*, 35 ins.; *Leh* on the Indus on the other side of the mountains has only 1 inch.

Over most of India the air is much cooler than during the hot season (March—May). See figure 10. Also study the following figures with reference to Bombay:

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Mean temperature in degrees F.	74·5	74·8	78·0	82·1	84·6	82·4	79·5	79·4	79·4	80·7	79·3	76·4
Rainfall (inches)	0·1	0	0	0·1	0·5	20·6	24·6	14·9	10·9	1·8	0·5	0·1

Note the fall in the temperature after the monsoon sets in and the rise when it stops.

The Retreating South-west Monsoon or the North-east Monsoon (Fig. 18): By the end of September the pressure of the air in Northern India and Burma has risen. The south-west monsoon current unable to penetrate into the high pressure regions, curves round the area of low pressure now lying over the centre of the Bay, and strikes the Madras coast of the Bay. This is called the *retreating south-west monsoon.* This monsoon gives rain to the north Coromandel coast and the Circars during October and the first half of November, and to the south Coromandel districts

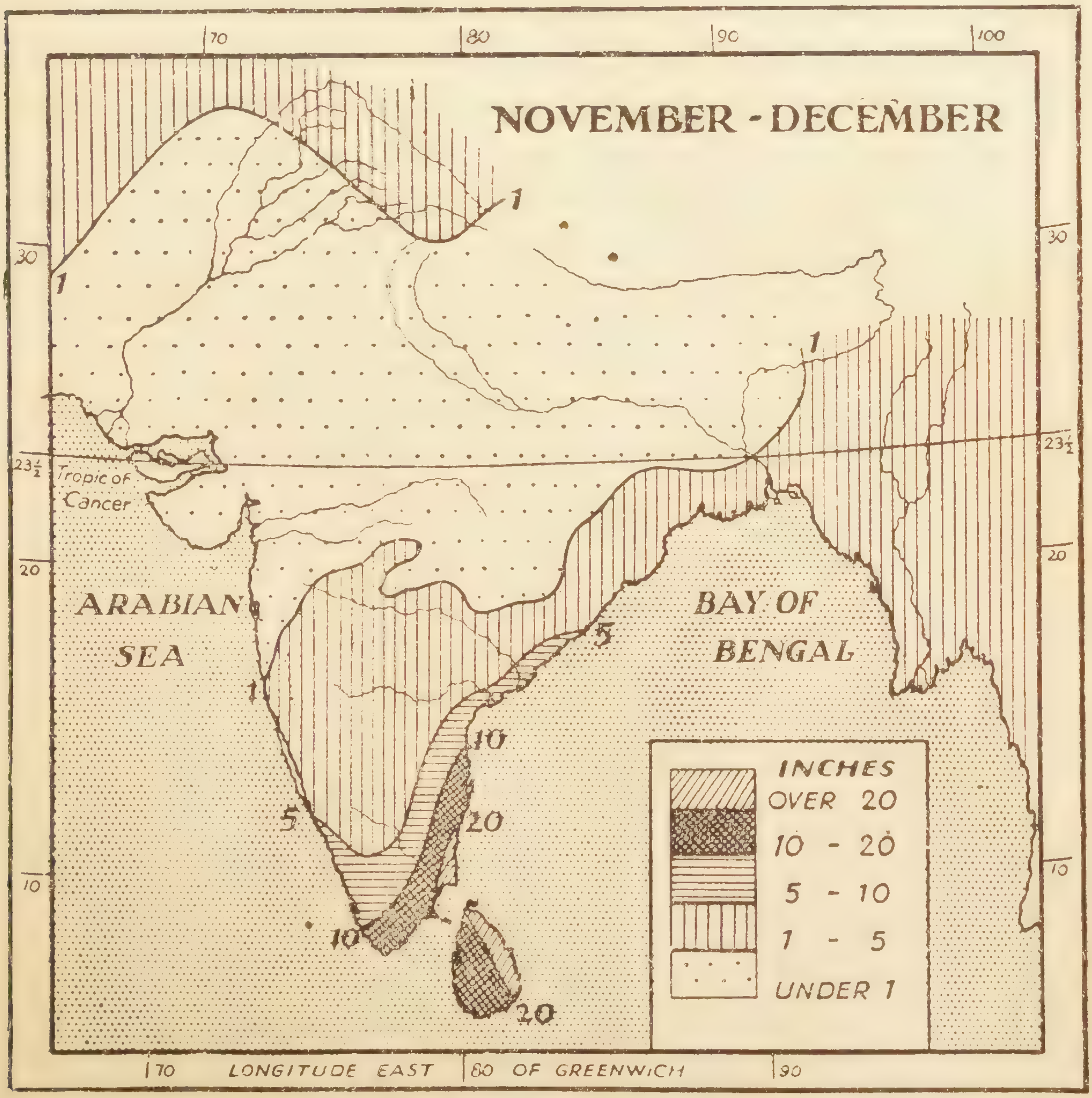

FIG. 18. INDIA: MEAN RAINFALL DURING THE NORTH-EAST MONSOON

during November and December. These months are the rainiest of the year in the Madras Presidency. Study the rainfall graph of Madras. South-east Madras has a total of 11·7 inches during the south-west monsoon, but 21·8 inches during the retreating monsoon. A considerable portion of the rain is brought by the cyclones that develop over the Bay during these months.

Cold Weather Season and the Rains of North-west India (Fig. 19): January is the typical cold weather month. The prevailing winds are the north-easterlies which are off-shore and therefore dry. But in the north-

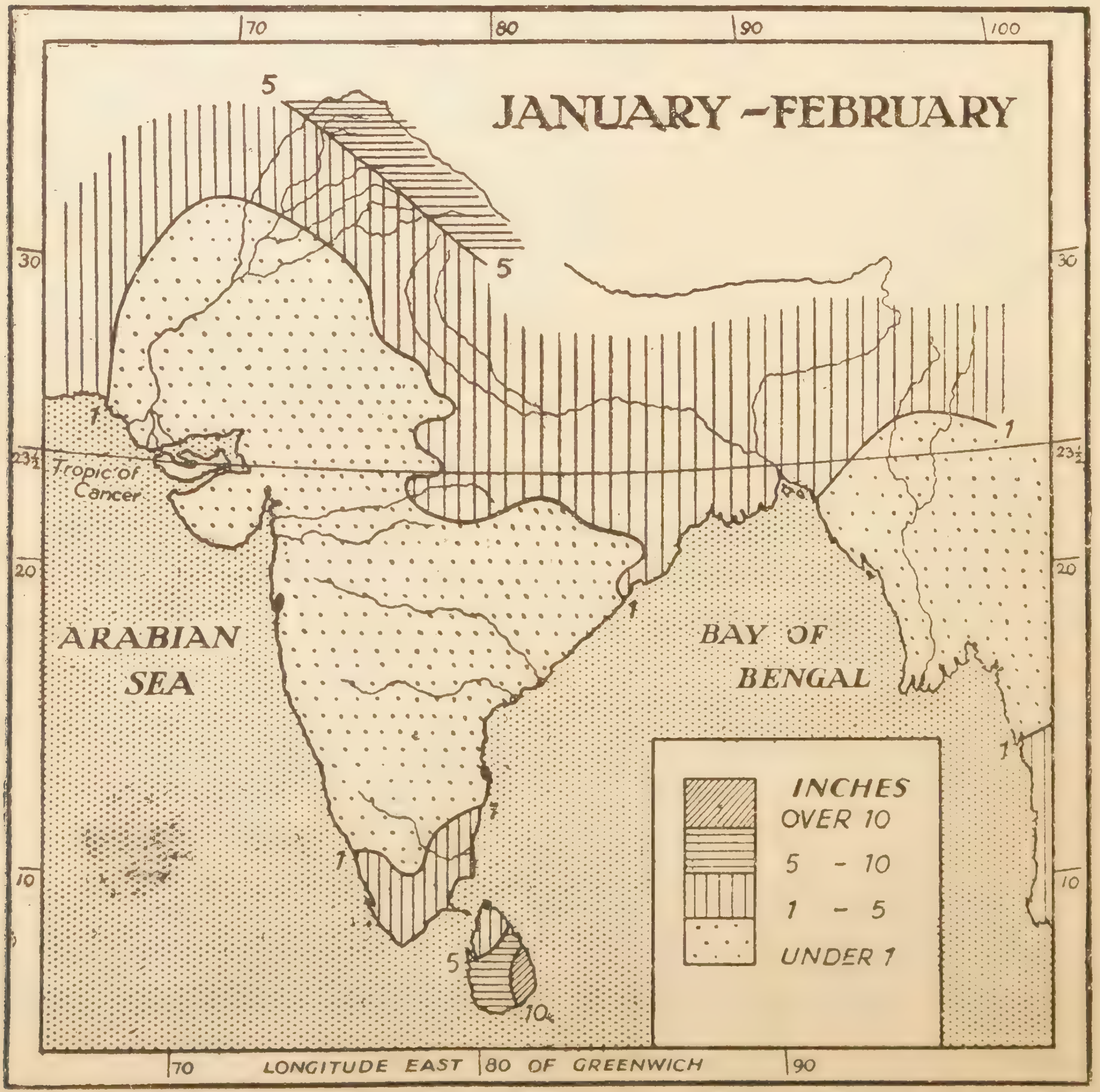

FIG. 19. INDIA : MEAN RAINFALL-COLD WEATHER

west of India, north-westerly winds coming from Persia and Afghanistan, give rain to the north-west frontier, the Punjab and the United Provinces. Nothing can be definitely said as to their origin and cause. The inner ranges of the Himalayas and all other highest parts of the chain derive the greatest part of their snowfall from them. The rain of this part of the year (January and February) is very helpful to the winter crops, wheat, barley, etc., of the north-west. In this season generally the weather is fine and the sky almost cloudless in the other parts of India.

Hot Weather Season (Fig. 20): March, April and

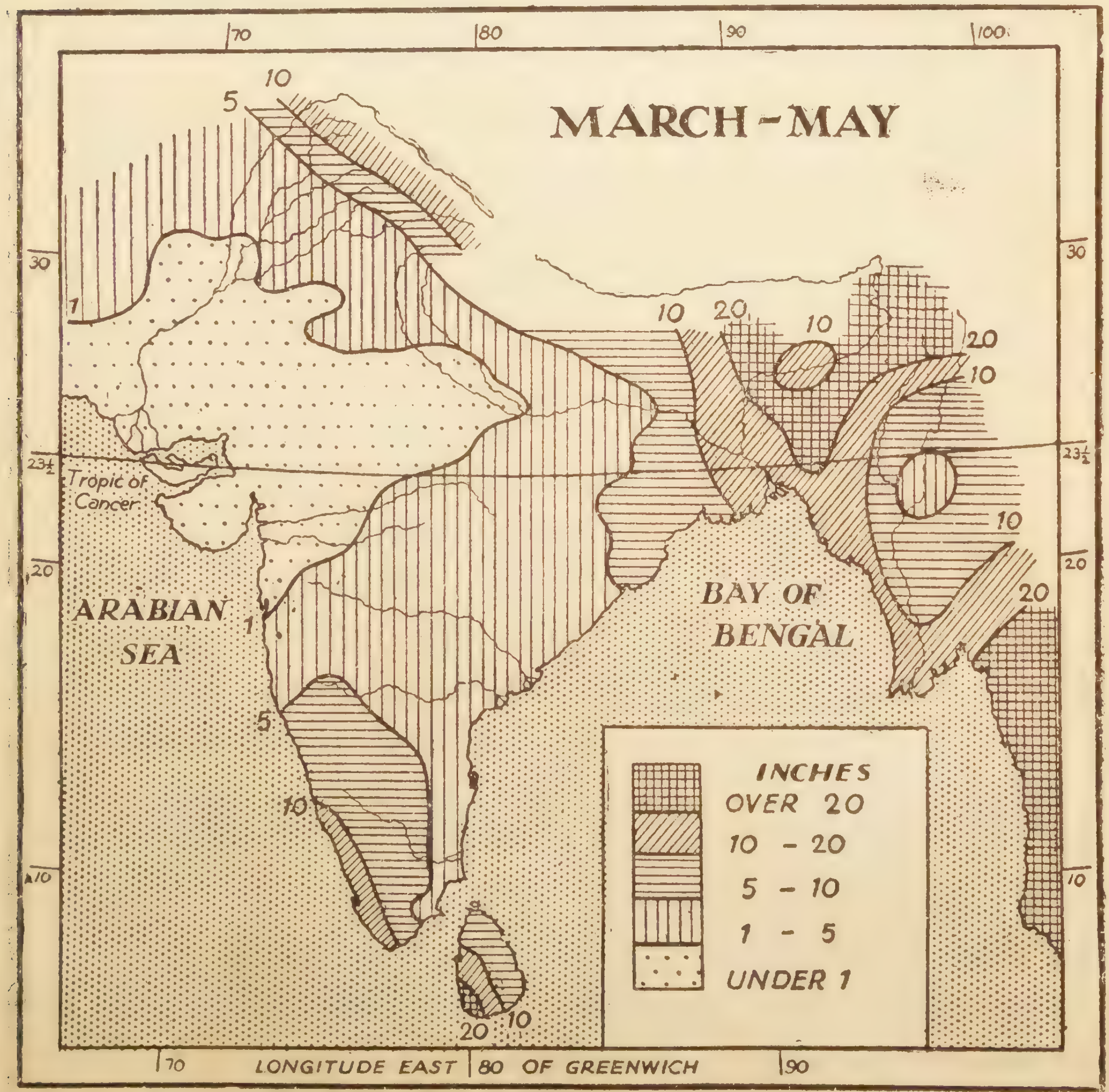

FIG. 20. INDIA: MEAN RAINFALL-HOT WEATHER

May form the hot weather months. The temperature is generally very high over the whole of India. All vegetation is burnt up. The sky is almost cloudless, but there are clouds of dust raised by winds especially in the dry areas. Violent thunderstorms with sharp showers of rain are characteristic of this season. The rainfall of Bengal, Assam and Burma in this season is largely of this kind and is due to convective air movement. In Assam this rain is of great importance for the tea-crop. In the south-west of India and west of Ceylon there is a mean rainfall of over 10 inches in May, known as the "Mango-showers" of South India. Thunderstorms are general when one monsoon changes to the other. In the next season of general rains, the temperature decidedly falls over most of India. Vegetation revives and the land looks again green.

Seasons in India: Thus we see there are four definite seasons in India: (1) *The cold weather season*: January and February; (2) *the hot weather season*: March April and May; (3) *the south-west monsoon season*: June, July, August and September; (4) *the retreating monsoon season*: October, November and December.

Mean rainfall for the whole of India in the cold weather period is 0·9 inch; in the hot weather period, 4·4 inches; in the south-west monsoon period, 35·4 inches and in the retreating monsoon period, 4·8 inches.

MAJOR CLIMATIC REGIONS OF INDIA (Fig. 21)

These can be grouped under four great regions of rainfall. (Refer to the political map also).

(1) **Very heavy rainfall region** with more than 80 inches in the year. This includes Assam and Konkan and Malabar coasts. This area is safe from famine.

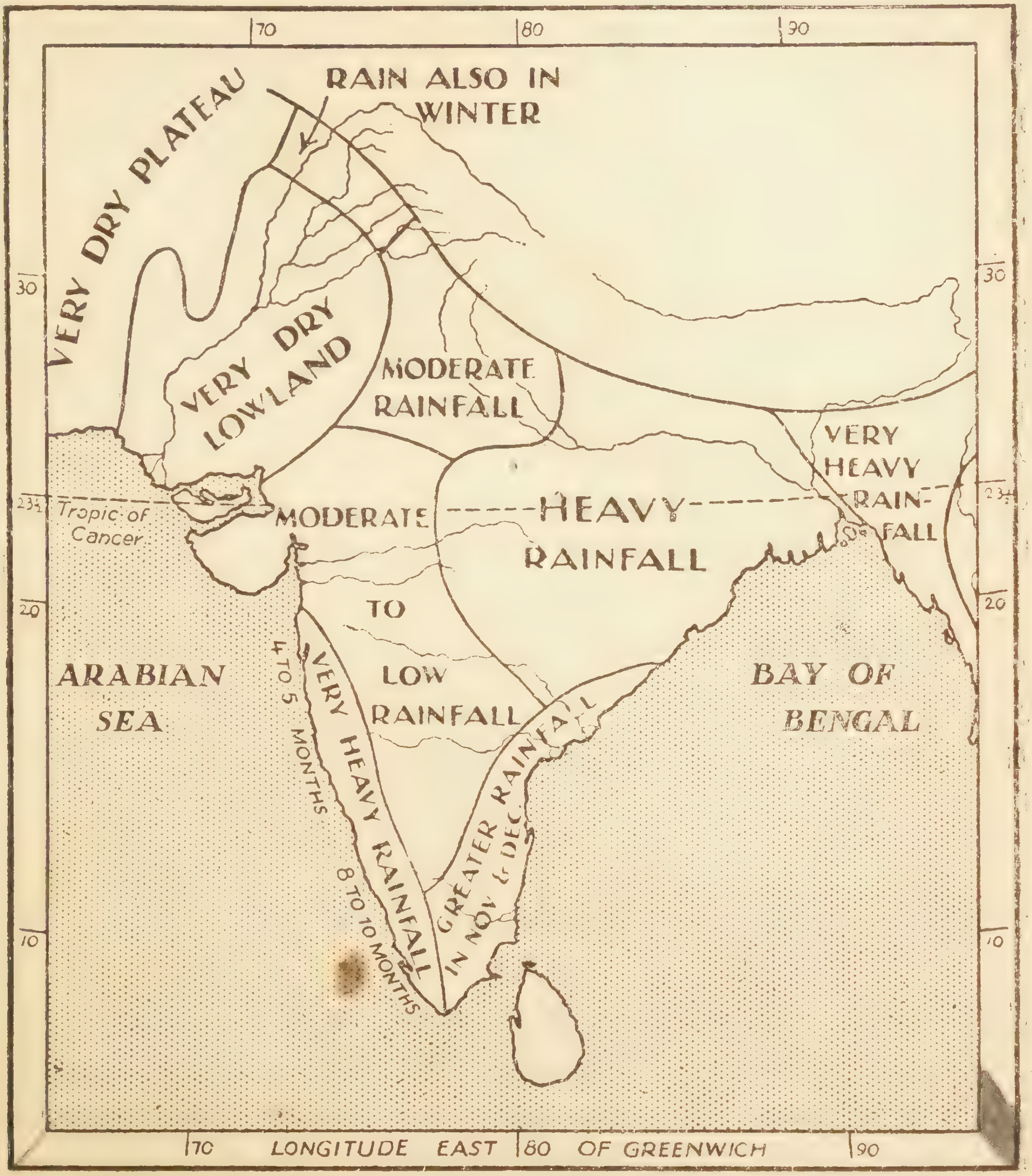

FIG. 21. THE MAJOR CLIMATIC REGIONS OF INDIA

(2) **Heavy rainfall region** with 40 to 80 inches in the year. This includes Bengal, Bihar and Orissa, Central India (east), Central Provinces (east), and Madras coast (north). Crops can be grown without much of irrigation.

(3) **Moderate to low rainfall region** with 20 to 40 inches in the year. This includes United Provinces (the Upper Ganges basin), Punjabi (east), Central India (west,)

Rajputana (east), Gujarat, Bombay, Deccan, Berar, Hyderabad and Mysore. Wet crops can be grown only with the help of irrigation. Madras (south-east) comes under this group, but most of its rain is confined to the retreating S. W. Monsoon period.

(4) **Poor or scanty rainfall region** with less than 20 inches in the year. This includes the arid plains of South-west Punjab, West Rajputana, Sind, and the arid plateaus of Baluchistan and North-west Frontier Province. A great part of this area is desert or semi-desert. Nothing can be grown without irrigation. Kashmir on the other side of the Himalayas falls under this group.

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Year.
Peshawar	1·5	1·3	1·9	1·8	0·7	0·3	1·7	2·2	0·7	0·2	0·6	0·5	13·3
Jacobabad	0·3	0·3	0·2	0·2	0·2	0·1	1·2	1·2	1·2	0	0·1	0·2	4·1
Karachi	0·6	0·3	0·1	0·1	0	0·4	3·2	1·8	0·7	3	0·2	0·2	7·7
Leh	0·3	0·4	0·2	0·2	0·3	0·2	0·5	0·5	0·2	0·2	0	0·2	3·2

Irrigation in India: Figure 22 shows the chief irrigated areas. From what we have studied about the climate of India we can see that the rainfall in India is in many places either *insufficient, irregular and uncertain*, or *confined to a few months* in the year. Hence in these places crops can be grown only with the help of irrigation. During rains millions of tons of water run through rivers uselessly into the sea. People in India have tried to save this water by building dams across the rivers and taking it through canals to irrigate the fields. Where rivers are absent, tanks have been dug and wells sunk. Hence there are three kinds of irrigation : (1) *canal*, (2) *tank*, and (3) *well*.

Canals are of two kinds : *Inundation Canals* and *Perennial Canals.* Inundation canals start from the bank of a river. The water of the river overflows into them in

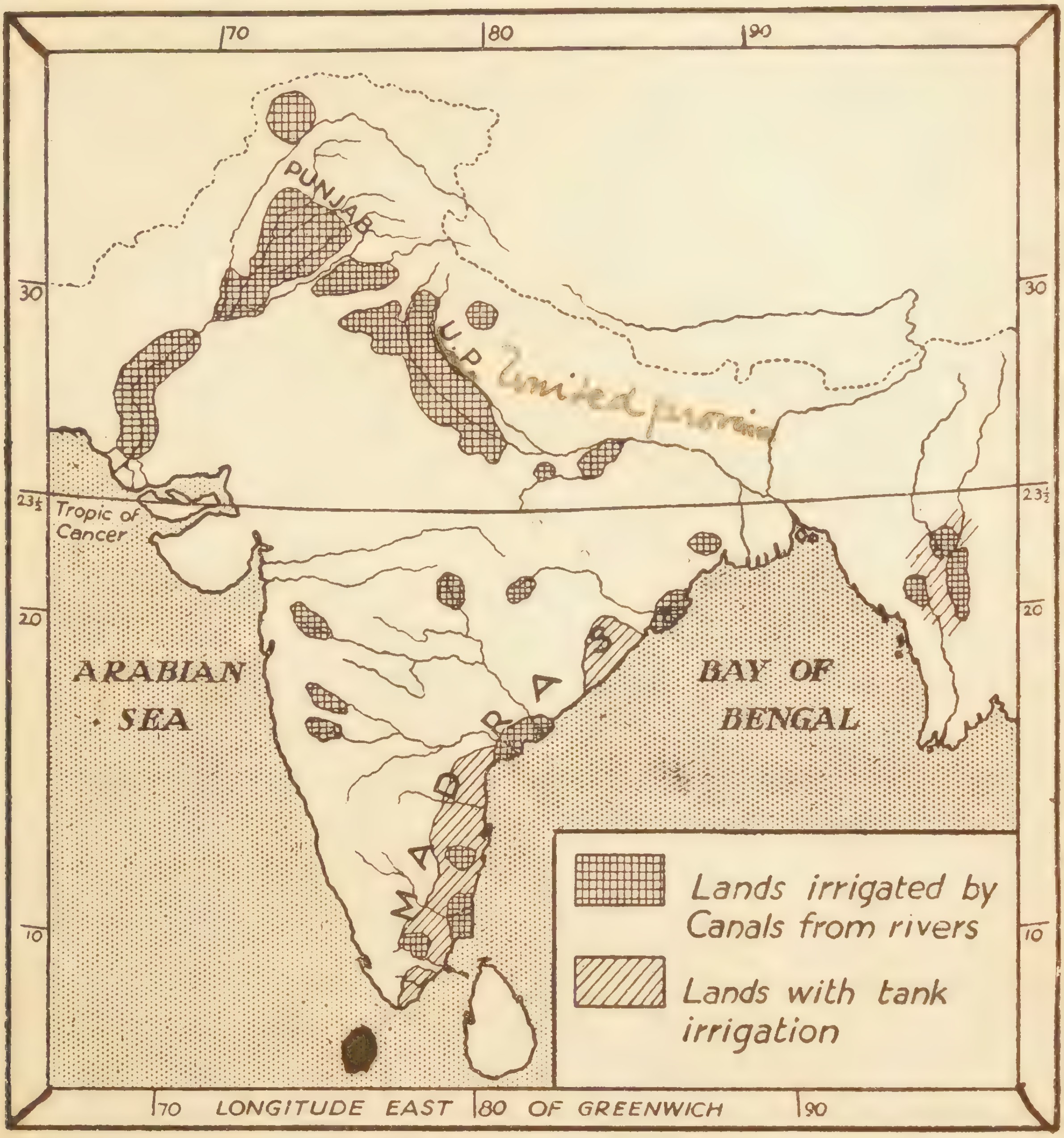
70
80
90
PUNJAB
U.P.
United provin
30
23½
Tropic of Cancer
20
10
ARABIAN SEA
BAY OF BENGAL
MADRAS
▦ Lands irrigated by Canals from rivers
▨ Lands with tank irrigation
70 LONGITUDE EAST 80 OF GREENWICH 90

FIG. 22 IRRIGATION IN INDIA

(Which Provinces have large irrigation works? Which Provinces have many tanks?)

the flood season, but in the hot season, the canals dry up; so they are not so useful as the perennial canals.

Perennial canals are those which have water in them all the year round. The Government has spent large sums of money in renewing old and in constructing new irrigation works. Most of the important irrigation canals are in the driest part of the Hindustan plain—in the Punjab, United Provinces and Sind. Though the rainfall in these

write what do you know about the Punjab irrigation :-

areas is low, the rivers that come from the Himalayas are never dry and bring much water to the plains. Dams are built across almost all the rivers just where they leave the mountains. The water collects behind the dams and forms big lakes from which long canals take the water to irrigate the fields.

The Punjab is the province where irrigation has been carried out on the largest scale (Fig. 23). The *Sirhind* and *West Jumna Canals* water the *doab* between the Sutlej and the Jumna. The other canals water the doabs between the tributaries of the Indus. Land which was formerly an

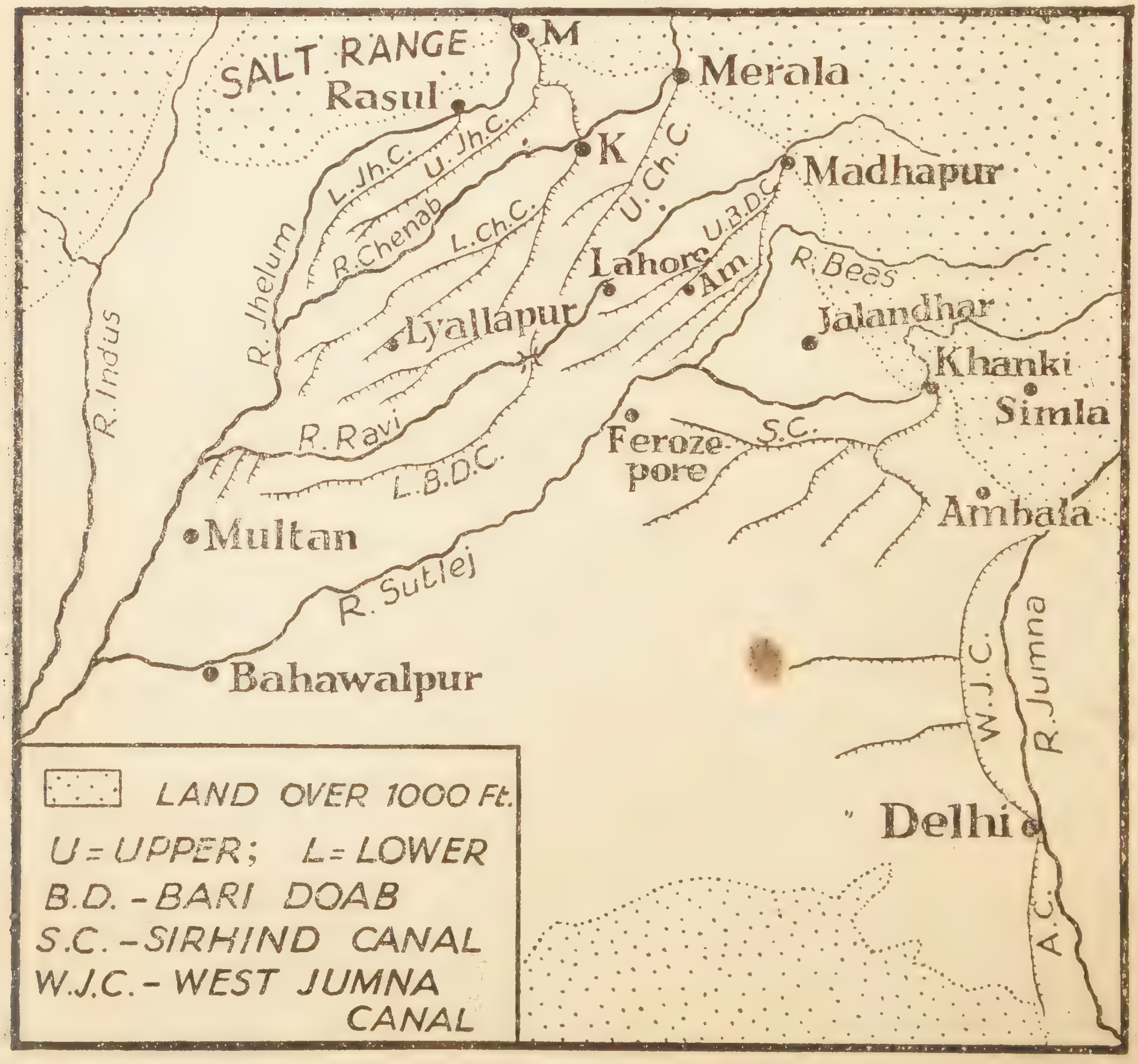

FIG. 23. IRRIGATION WORKS IN THE PUNJAB

unpeopled waste now has been turned into wheat and maize fields. The irrigation works have increased the crops and the population enormously. The *Lower Chenab Canal*, one of the largest irrigation works in the world, irrigates more than two million acres. The busy town of Lyallpur has sprung up here with a large agricultural college. One of the cleverest examples of irrigation is the *Upper Chenab-Lower Bari Doab Canal System.* Here the main Upper Chenab Canal is taken by an aqueduct across the Ravi and becomes the Lower Bari Doab Canal. (Bari Doab=the doab between the Bias and the Ravi.)

The irrigation works of the Punjab are not yet complete. *The Sutlej Valley Irrigation Scheme* is being carried out. This scheme is designed to irrigate a large area south-west of Ferozpore. There are to be three barrages across the Sutlej and one across the Panjnad. This work will affect the Indus in Sind. Hence for the benefit of Sind another scheme, known as the *Sukkur Barrage Project* was began in 1923. This is one of the largest irrigation works in the world. There will be seven great canals with numerous distributary channels irrigating over 8 million acres of land. The canals and their branches will have a total length of 7,000 miles.

In the Upper Ganges Valley the land is irrigated by the *Ganges Canal* (Upper and Lower), the *East Jumna Canal*, and the *Agra Canal.* The *Sarda River Canals* (opened 1928) from near the western border of Nepal, irrigate a large area in the United Provinces as far south as Lucknow. Southern Bihar is irrigated from the Son.

There are perennial canals serving the deltas of the Mahanadi, the Godavari, the Krishna and the Cauvery. There are also canals connected with the Palar, Cheyyar, and Tambraparni Rivers. One important irrigation work constructed by the Madras Government is the *Periyar Project.* A stone dam was built across the Periyar River, a small stream in Travancore state flowing into the Arabian Sea, and a tunnel was made through the Cordamon Hills. Then the water was taken through the tunnel to the eastern side of the hills, and it is now irrigating thousands of acres of land round Madura. The construction of a dam across the Cauvery at Mettur (Salem District), known as the *Mettur Project* is now going on.

The *Kannambadi dam* in Mysore and the *Bhandardhara dam* (25 miles from Igatpuri railway station) in Bombay are other important irrigation works in the Deccan.

Tanks: In most of the drier parts of Peninsular India tanks are formed by building thick mud walls across the valleys of small streams or in front of a sloping ground. The depressions thus formed are filled with water in the rainy season, and the water can be used to irrigate the fields below the tank bund. But in the hot season most of the tanks dry up completely.

Wells: Underground water is reached by wells. Garden cultivation is generally done with the help of water obtained from wells. North of the Ganges River the irrigation is almost entirely from wells and tanks.

Karez: In Baluchistan long underground tunnels called 'karez' are constructed to bring the water of the mountain streams to the plains as the country is dry and the surface water is easily evaporated.

Famine: Famines occur when the monsoons fail and there is shortage of rainfall. In regions of very heavy rainfall there is no fear of famine even if there is a shortage of 10 or 20 inches. It is not to be feared in places irrigated by large irrigation works as in the Punjab, the Upper Ganges Valley, and the deltas of the rivers on the east-coast. It is in the table-land of the Deccan that famine is most to be feared ; for here, especially in the Deccan districts of Bombay, Madras, and Hyderabad, the rainfall is usually only about 30 inches, and there are few irrigation works. Any great deficit in the rainfall causes failure of crops and consequent famine. In times past, India had suffered terribly from famine and thousands of people had perished. Now railways have been built and food can be sent quickly to the starving people. In the regions of heavy rainfall, the rains sometimes cause destructive floods which prove more disastrous than a famine.

Note: Since writing the Sukkur Barrage has been opened by the Viceroy.

EXERCISES

(1) Why is May hotter than June or July in India?

(2) Which is the hottest part of India? Why?

(3) Draw a graph to show the mean monthly temperatures of Madras and Bangalore.

(4) Explain how the south-west monsoon is caused?

(5) What is meant by a 'rain shadow'? Mention any three rain-shadow areas in India.

(6) Why is the South-west monsoon said to be the rain-giver of India?

(7) Account for the difference in the monthly distribution of rainfall between (i) Calicut and Madras or (ii) Calcutta and Multan. (Refer to the Rainfall graphs.) Read from the graph the approximate monthly rainfall of these four places.

(8) Illustrate by a diagram that rainfall decreases from east to west in the northern plains of India during the south-west monsoon.

(9) 'The Thar Desert lies exactly in the centre of lowest pressure.' Why? Is the centre of lowest pressure dry generally?

(10) Represent on the diagram the mean monthly temperature and rainfall of Bombay, and point out the effect of the monsoon rains on the temperature of the town.

(11) How are the winter rains of the Punjab and the hot weather rains of Bengal and Assam useful ?

(12) Why is irrigation necessary in India? Which province has the largest number of irrigation works? Why ? Mention the chief works of that province.

(13) Write what you know of (i) the Periyar Project, (ii) the Sukkur Barrage Scheme.

(14) Akyab, Benares, Delhi, Leh, Srinagar and Simla are represented by letters in the following. Identify each, stating reasons for your answer.

Places	Altitude in feet	Mean temp. Hottest month	Mean temp. Coolest month	Range	Mean Annual Rainfall
A	7.232	66·9° F	38·8° F	28·1° F	68·0''
B	718	92·2	57 9	34·3	27·7
C	5,204	73·0	30·7	42·3	27·0
D	5,267	91 3	63·0	31·3	40·6
E	20	85·0	69·5	15·5	193·6
F	11,503	62·6	17·3	45·3	3·2

CHAPTER III

VEGETATION AND ANIMAL LIFE

NATURAL VEGETATION (Fig 24.)

NATURAL VEGETATION is, as you know, the name given to the forest or grass that grows naturally without the help of man. Where population is dense, there the natural vegetation has been removed, and the land has been brought under cultivation as in the Ganges Valley. In

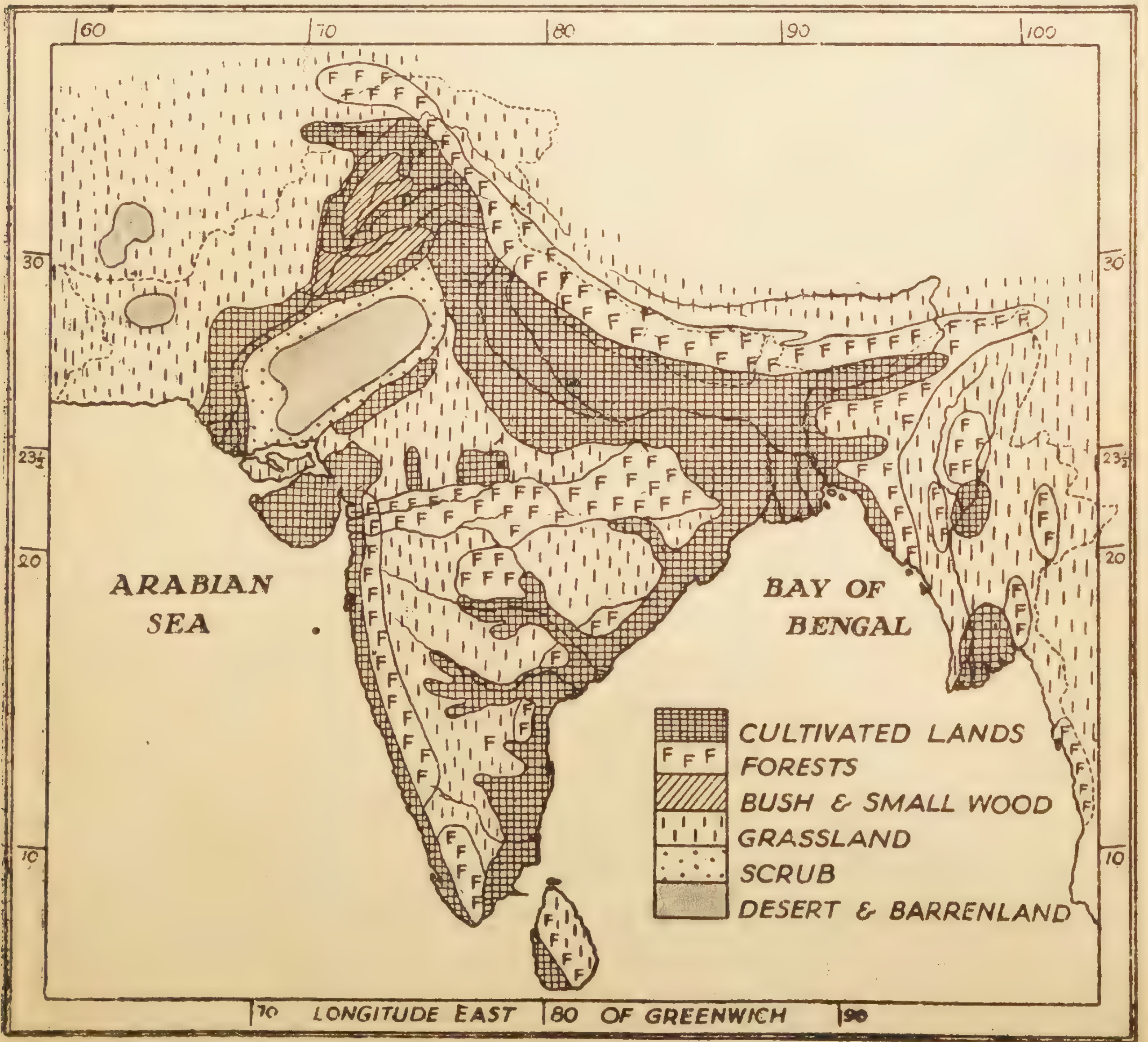

FIG. 24. INDIA: NATURAL VEGETATION

the hilly regions and in the less thickly peopled parts of the country much of the natural vegetation remains. The nature of the vegetation depends upon (i) *the rainfall* and (ii) *the physical features.*

The following are the principal kinds of natural vegetation found in India :—

(1) **Forests :** In areas of heavy rainfall, luxuriant forests are found: *e.g.*, the Himalayas, Assam, Burma and the Western Ghats. In the dry north-west only stunted thorny trees are found. The forests of India are divided into three main classes :—

(*a*) *The Evergreen or Wet Forest :* This is so called because the trees of this forest are always green. It is found in regions where the rainfall is over 75 or 80 inches in a year. The *wild mango*, *bamboos* and *palms* are characteristic of this forest. It is found in wetter eastern Himalayas (up to 5,000 ft. above sea level), Assam, the coastal regions of Burma and the Andamans. Deciduous trees like the teak also grow here. The bamboo and the coconut palm provide materials for a multitude of purposes.

(*b*) *The Deciduous or Monsoon Forest :* This forest is found where the annual rainfall is from 50 to 80 inches. The trees lose their leaves for part of the year, especially in the hot weather. This type of forest is very important, for in it grow the most valuable timber trees of India, *viz.*, the *sal*, *iron-wood* and *teak*. The *sandal*, *rosewood* and *ebony* are other useful trees. Of these the teak and the sal are the most important. The teak grows largely in Burma, Assam and the Western Ghats. Elephants are used in Burma and Travancore to drag heavy logs and pile them up in depôts. The timber is valuable because it is hard, durable and ant-proof. The sal yields a hard dark brown timber which is much used as railway sleepers.

It grows along the lower slopes of the Himalayas and in the northern part of the peninsula. It is not found south of the Godavary. The sandal-wood grows in the Mysore plateau, and the ebony on the Western Ghats.

(*c*) *The Dry Forest*: This occurs in places where the annual rainfall is below 30 inches. This consists largely of a species of acacia stunted in growth, and is found in in the drier parts of the central plateau and in the still drier region of the Punjab. Sometimes the trees are so small that they are really bushes. One of the most useful trees of the dry forest is the *khair* which yields *cutch* from which a yellow dye is prepared.

Besides these, there are other types of forest :

(*d*) The *Alpine* forests of the Himalayas between 3,000 and 12,000 feet of elevation which include trees such as the *oak*, *pine*, *fir*, *cedar* and *deodar* ;

(*e*) the *Mangrove forests* of the Ganges Delta called the '*Sundarbans*' which consist chiefly of *mangroves* that grow well on the flat and muddy sea-coasts, also called *Tidal forests.*

(*f*) the *Riparian* forests found along river banks.

(2) **Grasslands :** All upland regions with an annual rainfall of 30 to 40 inches are excellent pasture lands. Grasslands occur in Burma, Rajputana and the hilly regions of the peninsula. But a large part of the grassland is being cultivated. Almost the whole of Baluchistan and the large part of Burma are grasslands, for here the land is either too dry, or too hilly to allow cultivation.

(3) **Desert and semi-desert :** This lies between the Indus and the Luni river. Here lies the *Thar Desert* where the mean annual rainfall is too low to support any useful vegetation. Around the Thar lies a narrow border of scrub (or poor grass) land, marked steppe-deserts on the map.

(4) **Arable Lands:** All the alluvial tracts, *viz.*, the plains of the Ganges and the Indus, the west and east coast strips and the narrow valleys and broad deltas of the rivers of Peninsular India are the best cultivable lands, for there is sufficient rainfall or facility for irrigation by canals. In the other parts of the country cultivation is carried on wherever irrigation by tank or well is possible.

Vegetation varying with Elevation: On the southern slopes of the Himalayas we meet with the following vegetation belts: (1) up to an elevation of 3,000 feet there are tropical forests (tree-ferns, bamboo and sal); (2) from 3,000 to 5,000 ft., sub-tropical forests; (3) from 5,000 to 9,000 feet, evergreen oak forests; (4) from 9,000 to 12,000 feet, coniferous forests of pine and fir; (5) from 12,000 to 16,000 feet, the Alpine belt-covered with rhododendrons and tufts of mountain flowers or grass; (6) above 16,000 feet, perpetual snow.

Forest Products: The teak, sal and ironwood yield good timber. The pine trees of the mountains yield soft wood and resin. The sandal-wood of Mysore yields an oil which is used for making soaps. Many of the poorer classes of trees found all over India are used as fuel. Besides timber and fuel, the forests yield minor products such as *caoutchouc*, *lac* (a kind of yellow gum secreted on branches of trees by an insect), *cardamoms*, and *myrabolams* (used for tanning). The bamboo, as you have already learnt, is useful for very many purposes. The forests also afford grazing for countless herds of cattle.

Artificial Vegetation or Cultivated Products:—(Fig. 25). India is mainly an agricultural country. Nearly nine-tenths of the vast population of India get their living from agriculture. The following are some of the most important crops of India:—

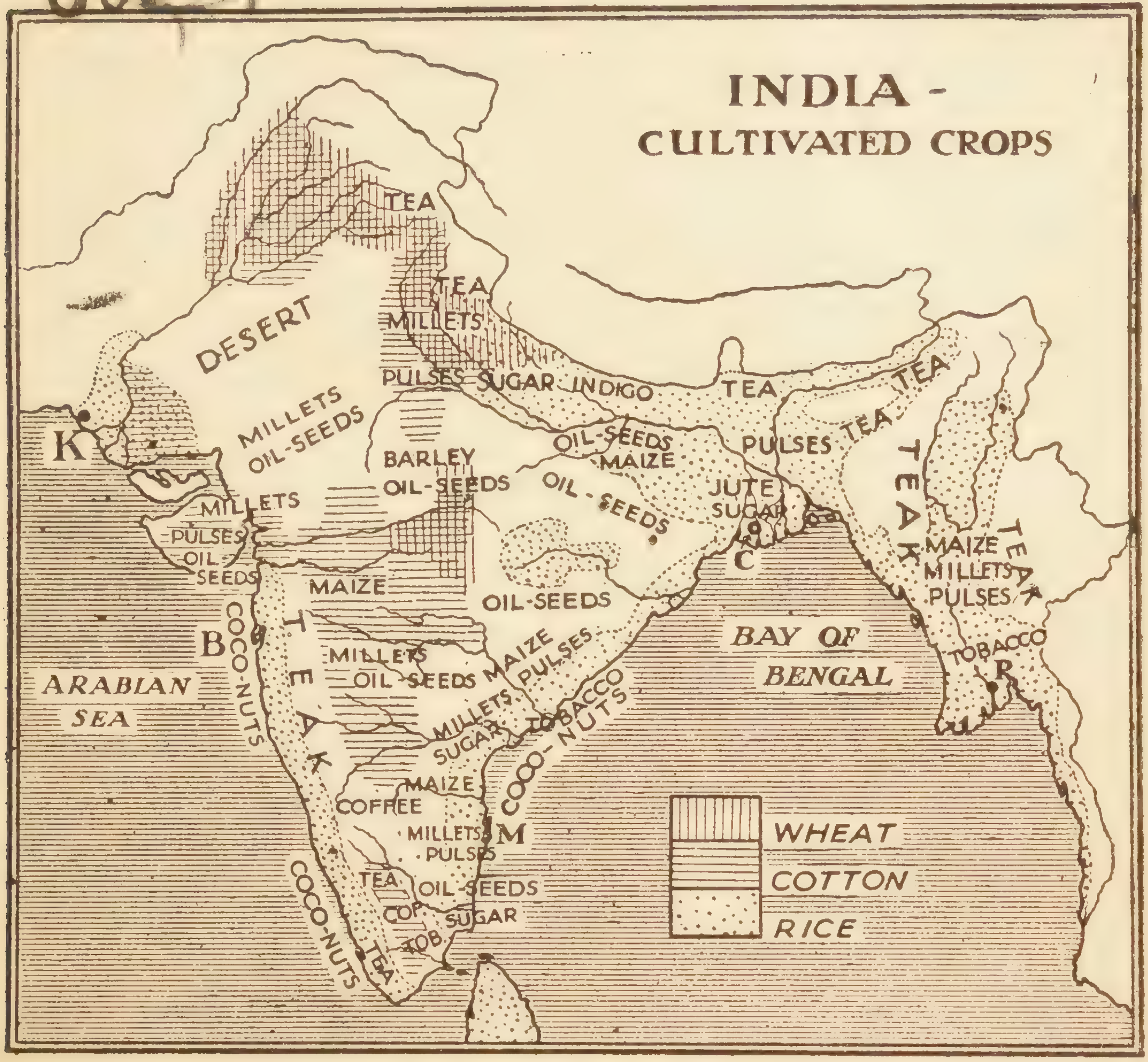

FIG. 25. CULTIVATED PRODUCTS

Rice, the chief food of a great portion of the people of India, requires a good soil, great heat and heavy rain. Where rain is deficient, water must be supplied by irrigation. The most important rice districts are the flat alluvial lands with heavy rainfall. It is largely grown in the valleys and deltas in Bengal, Assam, Burma, the United Provinces and Madras. Bengal has more than half the area under rice cultivation.

Wheat requires some rain only in the early stages of its growth, and a warm dry climate to ripen it. So it is grown as a winter crop in the north-west of India. It is sown at the end of the rainy season and harvested before the hot weather begins. It is an important crop in the Punjab and United Provinces. It is also grown in Bombay and the Central Provinces.

Barley grows in the same districts as wheat. Most of it comes from the United Provinces.

Maize, Millets and Pulses require less rain than rice. They are grown nearly all over India where the rainfall is moderate. Maize is grown both for its grain and as fodder for cattle. Millets form the staple food of the people in the drier parts of India where rainfall ranges from 20 to 40 inches. There are different kinds of millet, *e.g.*, *ragi* and *kambu.* The pulses are also many in number, the chief being *gram* and *dal.* In Bengal pulses are grown where rice does not flourish.

Fruits: Many kinds of fruits are found in India. Mangoes, plantains or bananas, guavas, pine-apples, jack-fruits, pomegranates, custard-apples, pawpaws, melons, oranges and limes are the most common.

மாதுளை சீதாப்பழம் பப்பாளிப்பழம் கிர்ணிப்பழம்

Sugar-cane requires good soil and irrigation. It is therefore grown chiefly in the United Provinces, the Punjab, and Madras. One half of the acreage under sugar-cane is in the United Provinces. Sugar is also made from the bastard date and palmyra palms. Large quantities of sugar are imported from Java every year.

Spices require great heat and rainfall. Cardamoms and pepper (the fruit of a creeper) are grown in the Malabar and Travancore coast. Turmeric and chillies are grown almost everywhere.

வாசனைப்பொருள் ஏலக்காய் மிளகு மஞ்சள் மிளகாய்

Tea is the dried leaf of a shrub which requires a warm moist climate, with a rainfall of about 100 inches, and a well-drained soil. It is, therefore, grown on the slopes of the Himalayas in Assam, Darjeeling, Dehra Dun (U. P.), Kangra (the Punjab), and on the Nilgiri Hills (Madras). Assam which has the best climate for tea produces three-fourths of the tea grown in India. Most of the tea is exported.

Coffee is the dried berry of a shrub which grows best in a warm, damp climate on hills at an elevation of from 2,000 to 5,000 feet above sea-level. It is chiefly grown in Coorg, Mysore and Travancore, especially on the landward side of the Western Ghats, as the shrub cannot stand the full force of the monsoon rains.

Oil-seeds are grown generally over the whole of India. There are six chief kinds of these seeds: *linseed*, *rape*, *mustard*, *sesamum*, *castorseed* and *ground-nuts*. The oil obtained from them are used for food, oil-baths and for lamps. A large quantity is exported to Europe where the oil is used for making soap and the oil-cake is used as food for cattle. Castor oil is used as medicine. Linseed is grown largely in the Central Provinces, castor in Bengal, ground-nuts in South India, and sesamum (gingelly) in the Central Provinces, Bombay, the United Provinces, Madras and Burma.

Coconuts grow best in the sandy soil near the sea where the climate is warm and rainfall is heavy. They are found on the west coast, in the islands of the Indian Ocean and on parts of the east-coast. The dried kernel of the nut, known as *copra*, yields the coconut oil, which, like other vegetable oils, is used for food, oil-baths and for lamps. It is also used for making soap. The fibre from the outer shell of the nuts, known as *coir*, is used for making matting.

Cotton is the soft white fibre covering the seed of the cotton plant that flourishes best in the black cotton soil. It needs frequent showers when young, but its seeds ripen best in dry sunny weather. It is a dry region crop, and is the most important of the crops not grown for food. There are two kinds of cotton: (i) the *Native Indian cotton* with short fibres or *Short-stapled cotton*; (2) the *American cotton* with longer fibres or *Long-stapled cotton*. Cotton is chiefly grown in Gujarat, Kathiawar, the Central Provinces and Berar, in the Ceded districts and in the Coimbatore and Tinnevelly districts of Madras. The American cotton has to be grown on irrigated and carefully prepared soil as in the Punjab and the Upper Ganges basin. The oil squeezed out of the cotton-seeds is used for lubrication and for making soap, while the cake forms the chief nourishing food for cattle in India.

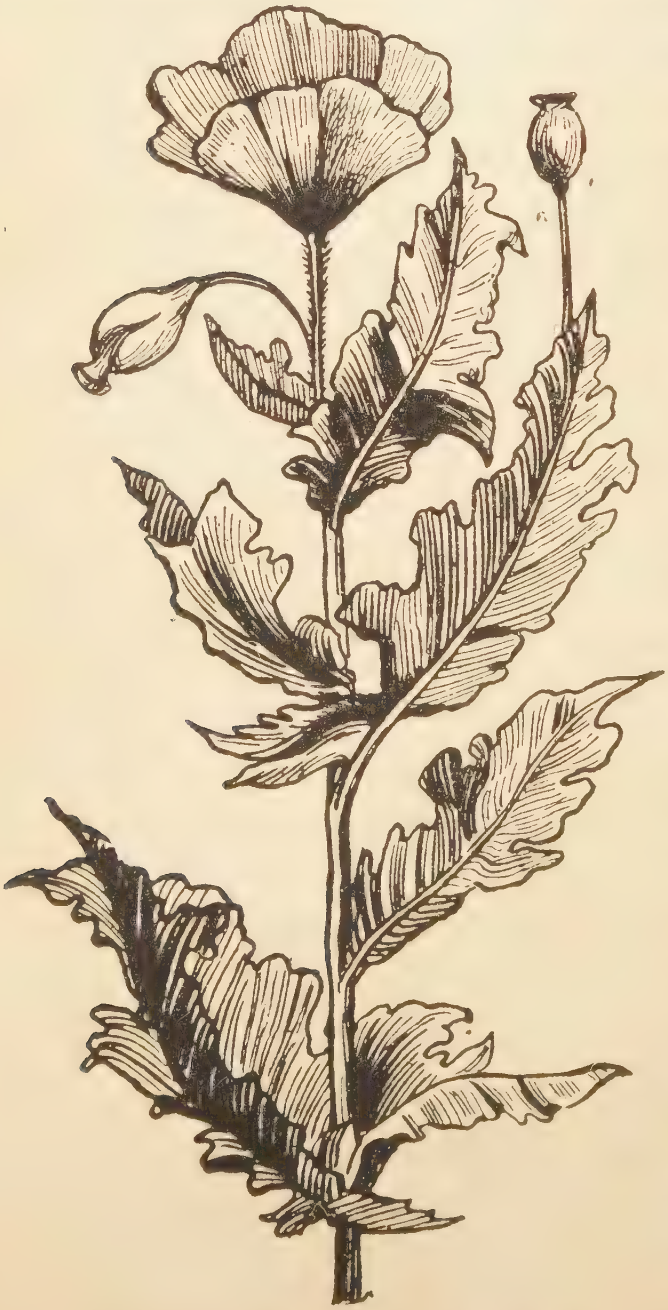

FIG. 26. THE OPIUM POPPY.

Jute is another plant grown for its fibre from which sacks are made. It grows best where rainfall is heavy and the soil is constantly renewed. Hence it is chiefly grown in the lower valleys and deltas of the Ganges and the Brahmaputra. Nearly all the gunny bags and sacks in the world are made from the jute of Bengal.

Indigo is a small dye-yielding plant grown largely in

Bihar and Orissa and in the United Provinces and Madras. The growing of this plant is no longer important as cheap chemical dyes are now manufactured in factories.

Opium (the dried juce oozing out of the seed-capsules of the poppy plant, fig. 26) is a useful drug; but it is poisonous unless taken in very small quantities. It is cultivated in the districts round Benares and Patna under licenses from Government. Very little opium is now grown as Government has stopped selling it to China where the people use it instead of tobacco.

Tobacco is the dried leaf of a plant that is grown in almost every part of India for local use. The chief areas are Bengal, the United Provinces, the islands or *lankas* of the Godavary and Krishna, and Burma.

Cinchona was introduced from Peru in 1860, and is grown on the hills, chiefly on the Nilgiris and at Darjeeling. From its bark, quinine is prepared.

Rubber is obtained from the juice of the trunk of a tree which grows best in very wet regions. There are numerous rubber plantations in Lower Burma and Travancore.

Some general idea of the acreage-importance of some of these crops can be gathered from the following diagram.

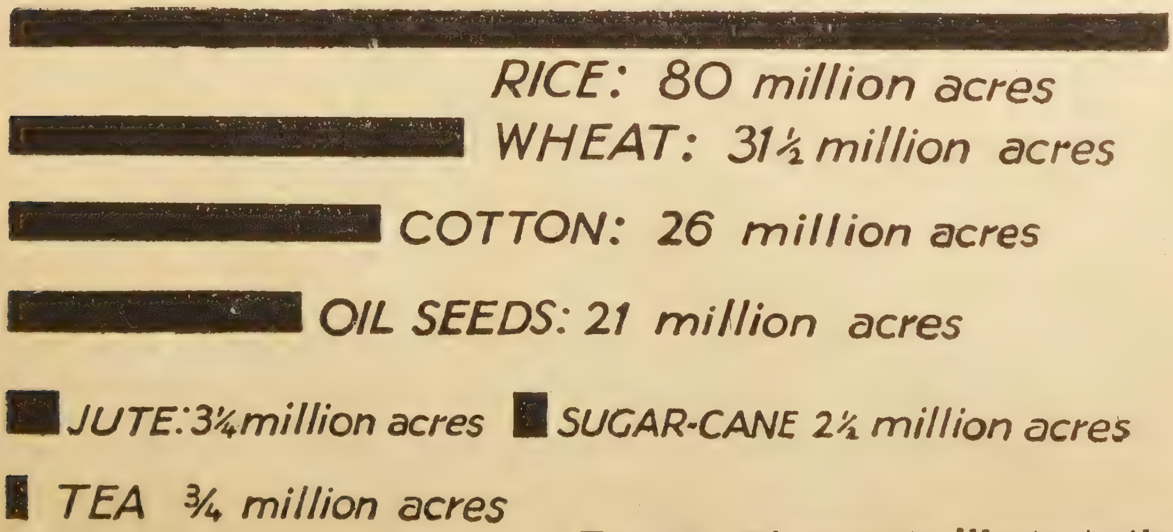

FIG. 27. Diagram to illustrate the total acreage of some of the important crops.

ANIMALS

Wild Animals are to be found in places where they are least disturbed by man. The larger wild animals are found in the valleys of the Himalayas (especially in the Terai region), on the Eastern and Western Ghats, in the jungles of Central India and in Upper Burma. The *tiger* (Fig. 28), *leopard*, *cheetah*, *hyœna* and other animals are found in the hills and jungles. *Foxes*, *wolves* and *jackals* are found everywhere.

The *wild elephant* is found in herds in the damp forests of Assam, Upper Burma, and in the Travancore and Mysore ranges of the Western Ghats. Every year many of these animals are caught and trained. *Wild buffaloes* are hunted on the hills of Southern India. The one-horned *rhinoceros* frequents the Arakan and other ranges of Burma. The *antelope* and *deer* are found in lowlands; and the *ibex* (a kind of goat: Fig. 29) is found in the Western Ghats, the Nilgiris, and on the mountains of Kashmir. *Monkeys* are to be seen nearly in every province.

Fig. 28. The Tiger

The *crocodile* is found in the rivers of Northern India and in the Mahanadi. There are several species of deadly snakes and every year many people die from snake-bite.

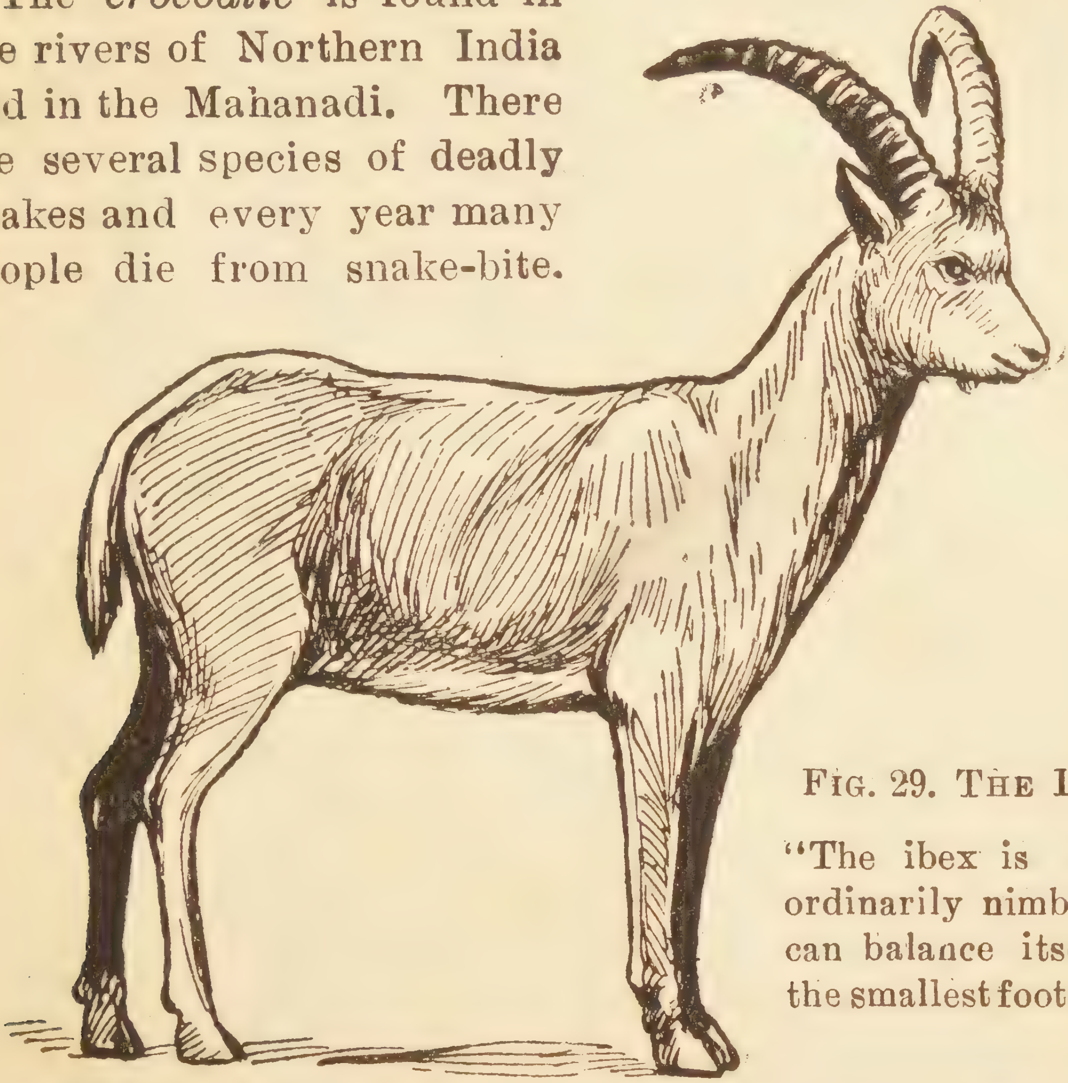

FIG. 29. THE IBEX

"The ibex is extraordinarily nimble and can balance itself on the smallest foothold."

The *cobra* is the typical poisonous snake. The huge *python* of the jungles (Fig. 30) is not poisonous, but it kills its victim by coiling round it and crushing it.

Domestic Animals: *Cattle, sheep, goats, horses, mules, donkeys* and *camels* are kept. As India is an agricultural country, large numbers of oxen and buffaloes are kept for ploughing and as beasts of burden. The *yak* is used to carry goods over the Himalayas. Horses, mules and donkeys are used in the hilly regions. In the dry, sandy regions of Rajputana and Sind camels are much used. The work of the tame elephant in the timber depots of Burma has already been referred to.

The *cattle* of India are used not only for ploughing and drawing carts, but also for supplying milk. There are different breeds of cattle —*North Gujarat*, *Nellore*, *Amrit Mahal* (Mysore,) *Arvi* (Central Provinces), *Malwi* (Central India), *Gir* (Kathiawar), and *Montgomery* (the Punjab). The Nellore and Gir cattle are good milkers. The *buffalo* is stronger and heavier than the ox, and is also used for ploughing, especially in the rice fields of Lower Burma. It also supplies milk like the cow.

Sheep are found in dry hilly parts which are not good enough for cattle. The sheep of India are very poor, when compared with those of Australia or New-Zealand, and they do not give good wool or meat. They are most abundant in Madras. The best wool comes from sheep pastured in the Punjab, and in the hill districts of the United Provinces. *Goats* are found everywhere in India, and live upon the poorest of grass and shrubs. The soft hair of the Tibetan goat is woven into shawls in Kashmir.

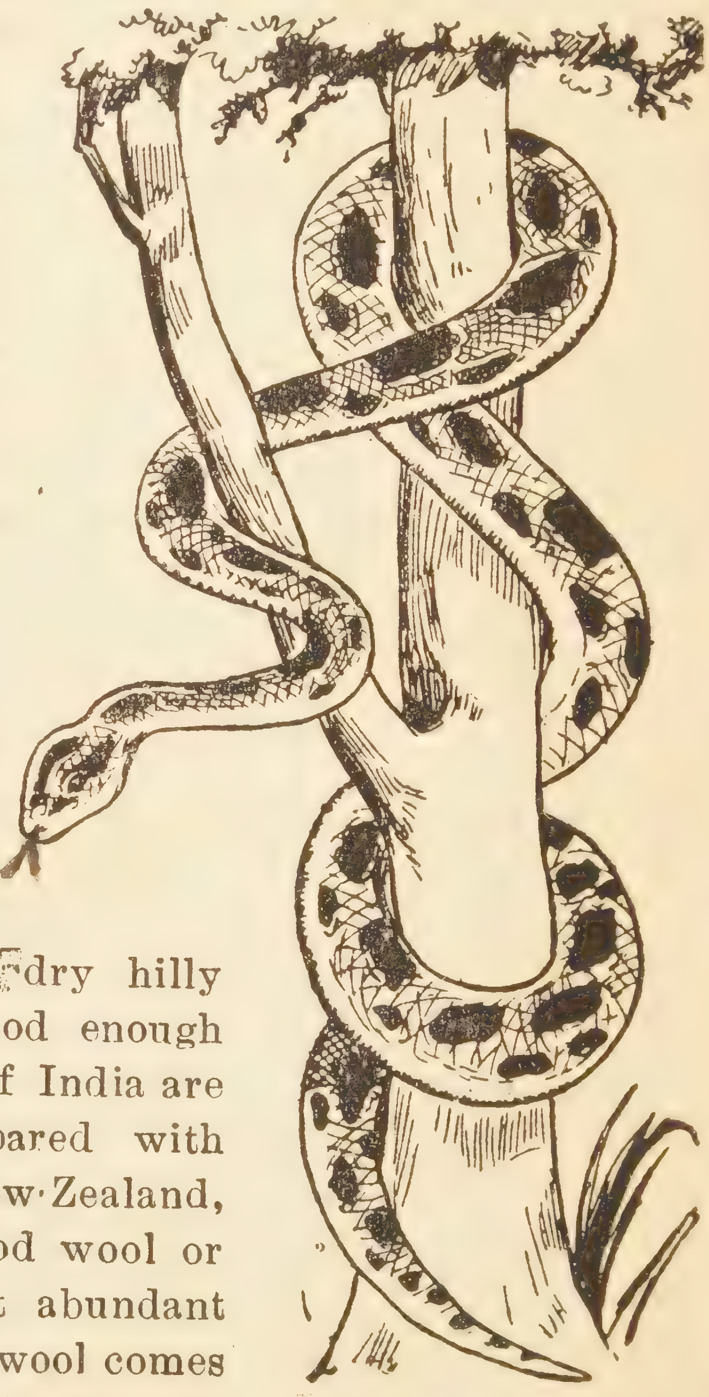

FIG. 30. THE INDIAN PYTHON.

This huge Snake is not poisonous, but kills its prey by coiling round it and crushing it.

Horses and ponies are fewer in number than the cattle or sheep. Much attention has been given to the breeding of horses and mules by the Government for military purposes. But India imports its best horses from Arabia and Australia ; the animals coming from the latter place are called " Walers " (after New South Wales).

A similar attempt has been made by the Government to develop the *fisheries* of India. This effort has met with success in Madras and Bengal. Various kinds of edible fish abound the tanks and rivers. *Pearl* and *conch-shell* fisheries are carried on in the Gulf of Mannar.

Silk is an animal product, being spun by a grub called the silk-worm. Silk-worms thrive best on the leaves of the mulberry tree. Mulberry silk is produced in Bengal, Mysore, and the Punjab. There are also 'wild' silk-worms which feed on the leaves of many other trees. The silk obtained from these worms is called *tasar* or *tusser silk.* Assam is famous for this kind of silk.

Lac is a kind of yellow gum deposited on the branches of trees by a small insect. It is gathered by wild tribes in Assam, Chota Nagpur, and the Shan States (Burma). A dye and a kind of wax called *shellac* are obtained from it. The latter is used as varnish.

EXERCISES

(1) Mention the chief types of forests in India, stating the most important trees that grow in each.

(2) How are the following trees useful : Teak, sal, sandal : khair, pine and coconut palm ?

(3) Which parts of the following plants are useful to man : rice, cotton, jute, coffee, tea ? Name the chief areas where they are largely grown.

(4) Classify the crops of India under the following heads : (i) field crops ; (ii) hill crops.

(5) What animals are useful in India ? In which parts of the country are they used ?

Rajaravelu IV Form

CHAPTER IV

PEOPLES, POPULATION AND POLITICAL DIVISIONS

DISTRIBUTION OF POPULATION (FIG. 31).

The density of population in a country depends upon the production of food. This depends upon the fertility of the soil which in turn depends upon physical features and rainfall. But in a hot country like India fertility depends chiefly on rainfall. Hence the density of population in our country varies with the amount of rainfall. But a mountainous area will not have a dense population though it has heavy rainfall, *e.g.*, the Brahmaputra valley and Burma. A place with a light rainfall may have a fairly dense population if it has a good system of irrigation, *e.g.*, the Upper Ganges Basin and the Punjab. Compare the relief, rainfall and population (Fig. 31) maps. You will find from the map that the population is densest in the flat alluvial tracts where cultivation is possible. Hence the population of India is mainly *rural*, *i.e.*, most of the people live in villages near their fields. India has a very large population—352 millions according to the recent census—and the average density is about 200 per square mile. One-fifth of the total population of the world is found in our country.

The Ganges Basin and the West Coast strip have a very dense poupulation as the rainfall is heavy and certain. The southern part of the Upper Ganges Basin has insufficient rain, but the population is dense on account of the irrigation works.

The East Coast from the Ganges delta to Cape Comorin has a fairly dense population as it is a fertile alluvial plain with well-irrigated deltas.

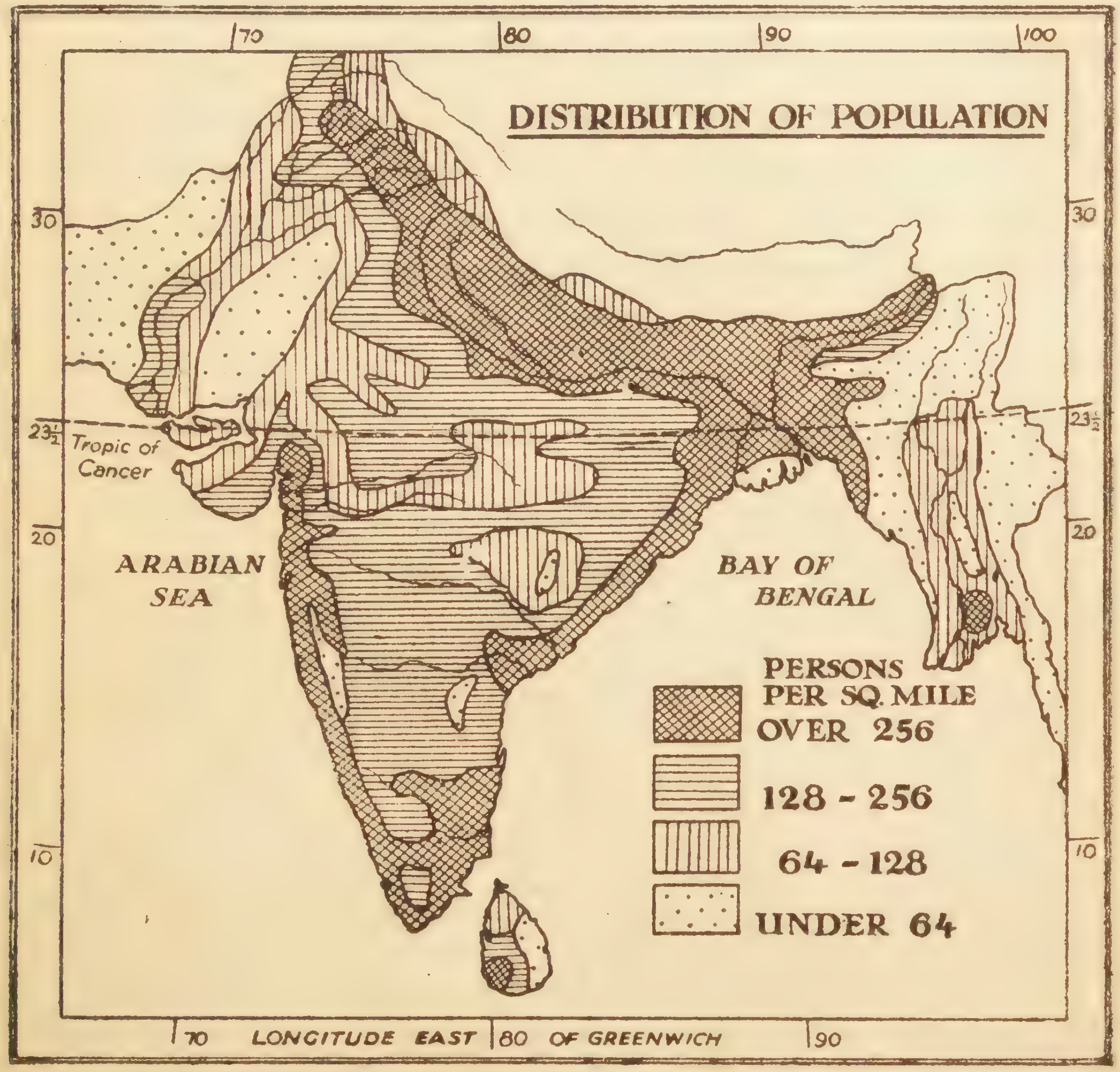

FIG. 31. DISTRIBUTION OF POPULATION IN INDIA

The table-land of the Deccan and Central India is thinly peopled as the rainfall is small and uncertain.

The most thinly peopled parts of India are (*a*) the rainless north-west, (*b*) the unhealthy forested Terai and Sunderbans, and (*c*) the hilly and forested Brahmaputra valley, the north-east part of the Deccan plateau, and Burma.

The Indus valley in the Punjab is densely peopled though its rainfall is low. Why?

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Races (Fig. 32) : The population of India includes people of different types. This is due to invasions of the country by various tribes in bygone times. The great agricultural and mineral wealth of India made it the land of desire of Asiatic peoples. The land boundary of India was exposed to attack in the north-west and east. Hordes of Aryans, Turks and Mongols (Moghuls) poured through the Khyber pass, Tibetans across the Himalayas, and Mongols (Chinese and Siamese) through the eastern highlands. These invaders came to stay, and their descendants, mingling with the Dravidians and other earlier inhabitants have formed the various races. Figure 32 shows the races into which the people of India and Burma have been grouped.

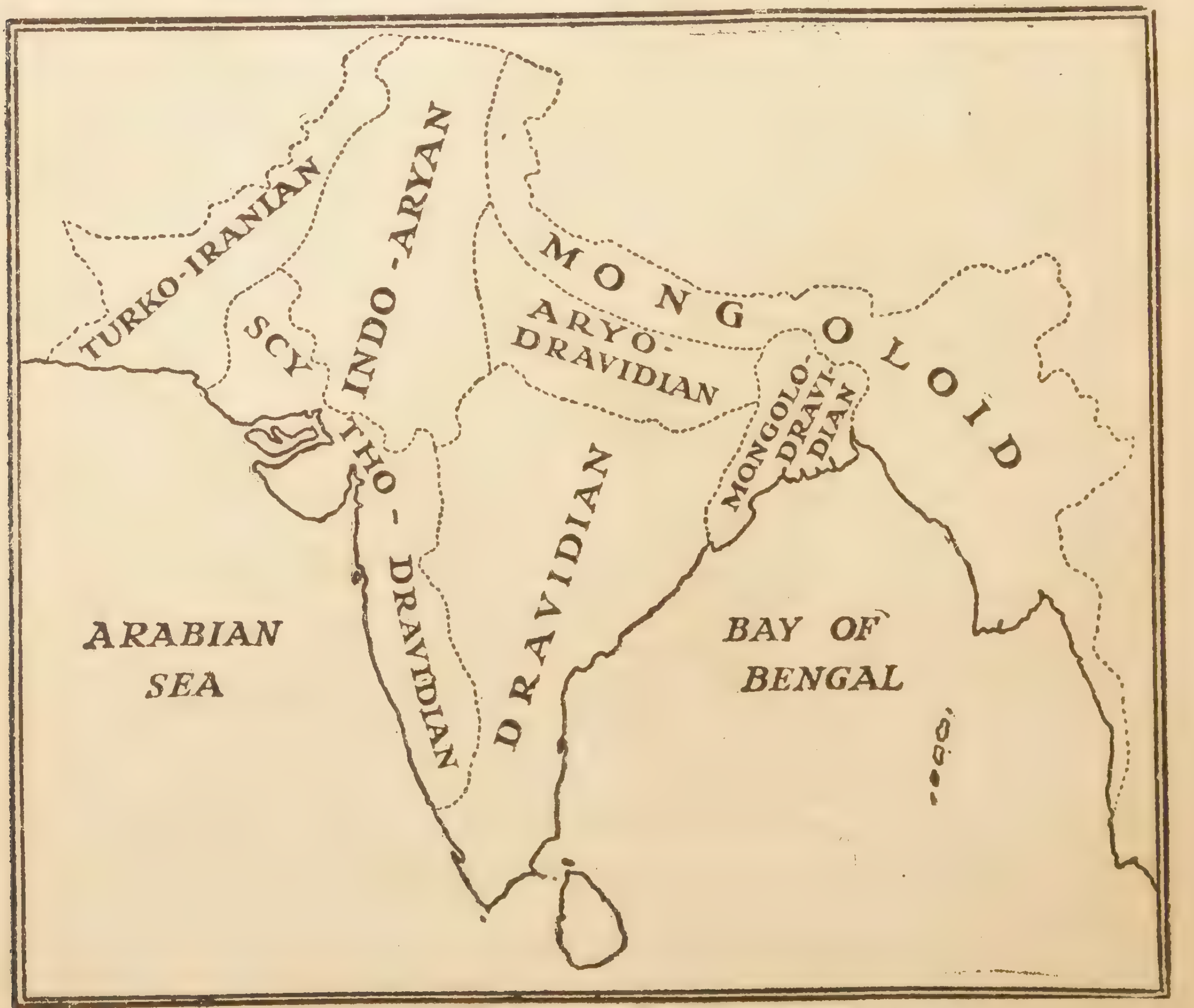

FIG. 32. THE PREVAILING RACES OF INDIA

(1) *The Dravidians* : These were the original inhabitants of the country. They were short, with dark skins, hair and eyes. Some think that there were very wild uncivilised peoples who may be called Pre-Dravidian peoples and that Dravidians invaded the country from outside and drove the wild inhabitants to the hills and forests. Anyhow the Dravidians have been in the country from pre-historic times. They are now found in the peninsula of India south of the Vindhyas, and are advanced in civilisation. But semi-civilised tribes are found in the forests of the plateau, *e.g.*, the *Santals* in Bengal, the *Gonds* in the Central Provinces, the *Todas* on the Nilgris.

(2) *The Indo-Aryans* : A branch of the white people who probably lived on the steppes of Asia many centuries before the Christian era entered India by the north-western passes. They were tall with fair skins and straight noses. These Aryans have kept their race almost pure, and now occupy the Punjab, Kashmir and Rajputana.

(3) *The Aryo-Dravidians* : Long after this first invasion, a second wave of Aryan invaders came and settled in the plains of the Ganges and the Jumna. They mingled with the Dravidians whom they conquered and formed a mixed race with shorter stature and darker skin. This type occupies the United Provinces and part of Bihar.

(4) *The Mongoloids* : The Mongolian race entered the country from Tibet and China. The peoples of Kashmir (nearest Tibet), Nepal, Bhutan, Assam and Burma belong to this type.

(5) *The Mogolo-Dravidians* : These form a mixture of the Mongols and Dravidians. This type is found in Bengal, the plains of Assam, and Orissa.

(6) *The Scytho-Dravidians* : Long after the Aryans settled in India, successive hordes of Scythians came down the Indus valley and settled in Sind, Gujarat, and the western Deccan. The Mahrattas belong to this type.

(7) *The Turko-Iranians* : These are supposed to be a mixture of Turks and Persians, and have fair skins and long narrow noses. These are found in Baluchistan and North-West Frontier Province.

India has also attracted people from Europe : the Portuguese, the French and the English came to India as traders. The whole of India and Burma has been brought under British administration, but the Portuguese and the French still hold a few possessions. *Goa*, *Diu* and *Daman* are Portuguese ; and *Pondicherry, Karaikal, Chandranagore, Mahe* and *Yanam* are French.

Languages (Fig. 33)': The various languages of India are grouped under three heads: (1) *Dravidan* ; (2) *Aryan* ; (3) *Indo-Chinese* or *Tibeto-Burman.*

(1) The *Dravidian* languages are spoken in the south of the peninsula including nearly the whole of the Madras Presidency, Mysore, the southern corner of the Bombay Presidency, and the eastern and southern parts of Hyderabad. *Tamil* is spoken over the whole of South India as far as Mysore and the Ghats on the west. *Telugu* is spoken over all the east of the peninsula north of the Tamil area, *Malayalam* on the Malabar coast, and *Kanarese* in Mysore and over part of Bombay and Hyderabad. *Tulu* is spoken in a small area in the South Kanara district. Dialects of Tamil, Telugu and Kanarese are spoken by the hill tribes.

(2) The *Aryan* languages are spoken over the rest of India. In the north-west plateau *Baluchi* and *Pashto* are

spoken. Sindhi, Gujarati, Marathi, Rajasthani, Lahnda, Punjabi, Kashmiri, Hindi (West and East), Bihari, Bengali, Oriya and Assamese are all Aryan languages. Of these *Hindi* is most widely spoken. *Hindustani*, a dialect of Hindi, is spoken by most of the Muhammadans of India.

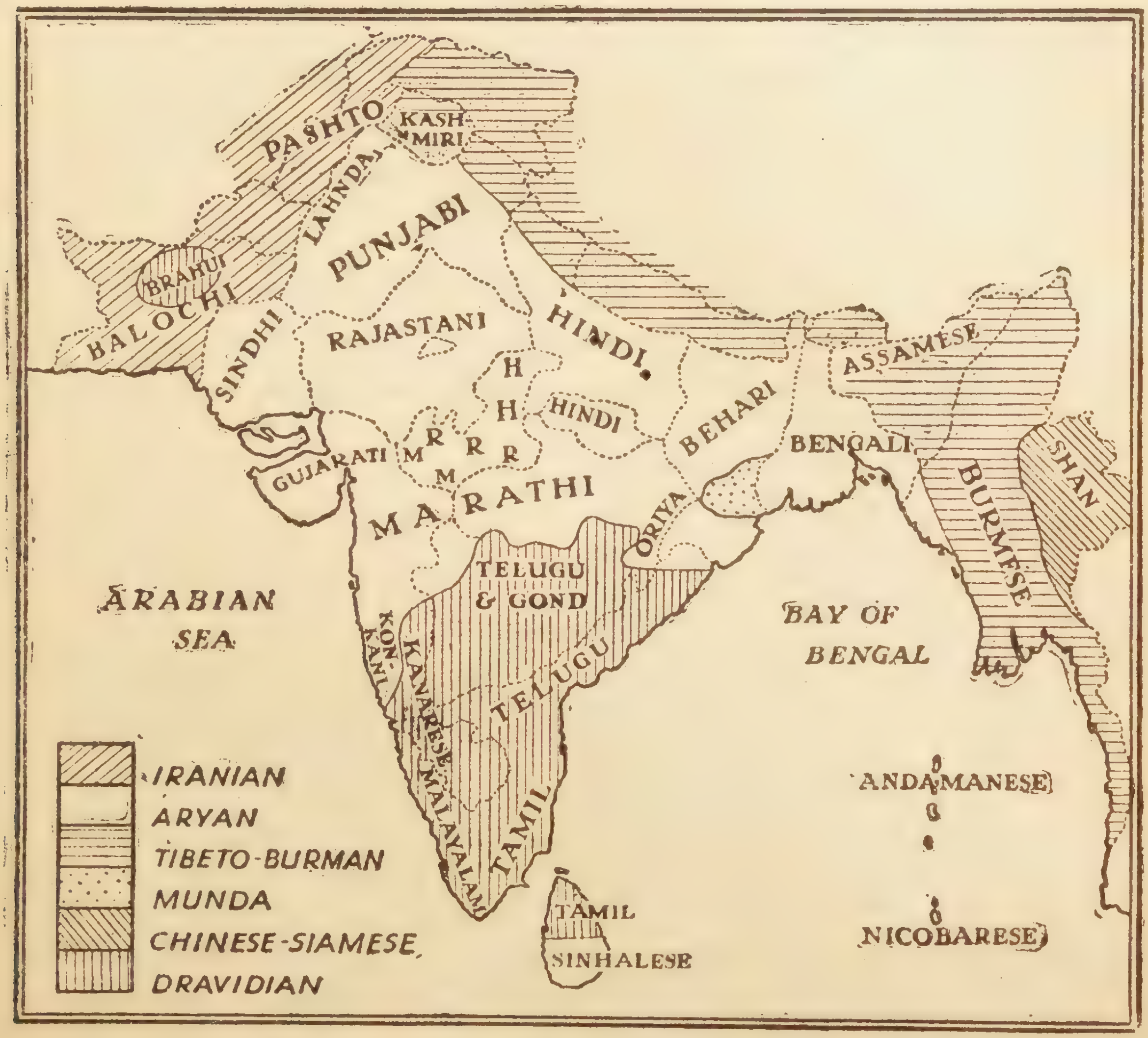

FIG. 33 THE LANGUAGES OF INDIA

(3) *The Indo-Chinese* or *Tibeto-Burman* languages are spoken by the hill tribes of the Himalayas and also over most of Burma where the chief language is Burmese.

(4) There is a fourth group, the *Munda* languages. These probably represent the languages spoken by the oldest inhabitants of India. They are now spoken by only

a few of the wildest of the hill tribes living in the forests of Chota Nagpur.

English is understood by educated people throughout the country,

The Aryan languages are spoken by about 232 millions; the Dravidian by 60½ millions; Tibeto-Burman by 13½ millions; and the Munda languages by 4 millions. (1921 Census).

Religions (Fig. 34): The Aryans spread their religion and culture wherever they went and settled. As they intermarried with the Dravidians they converted them to their religion. As time went on and various tribes came

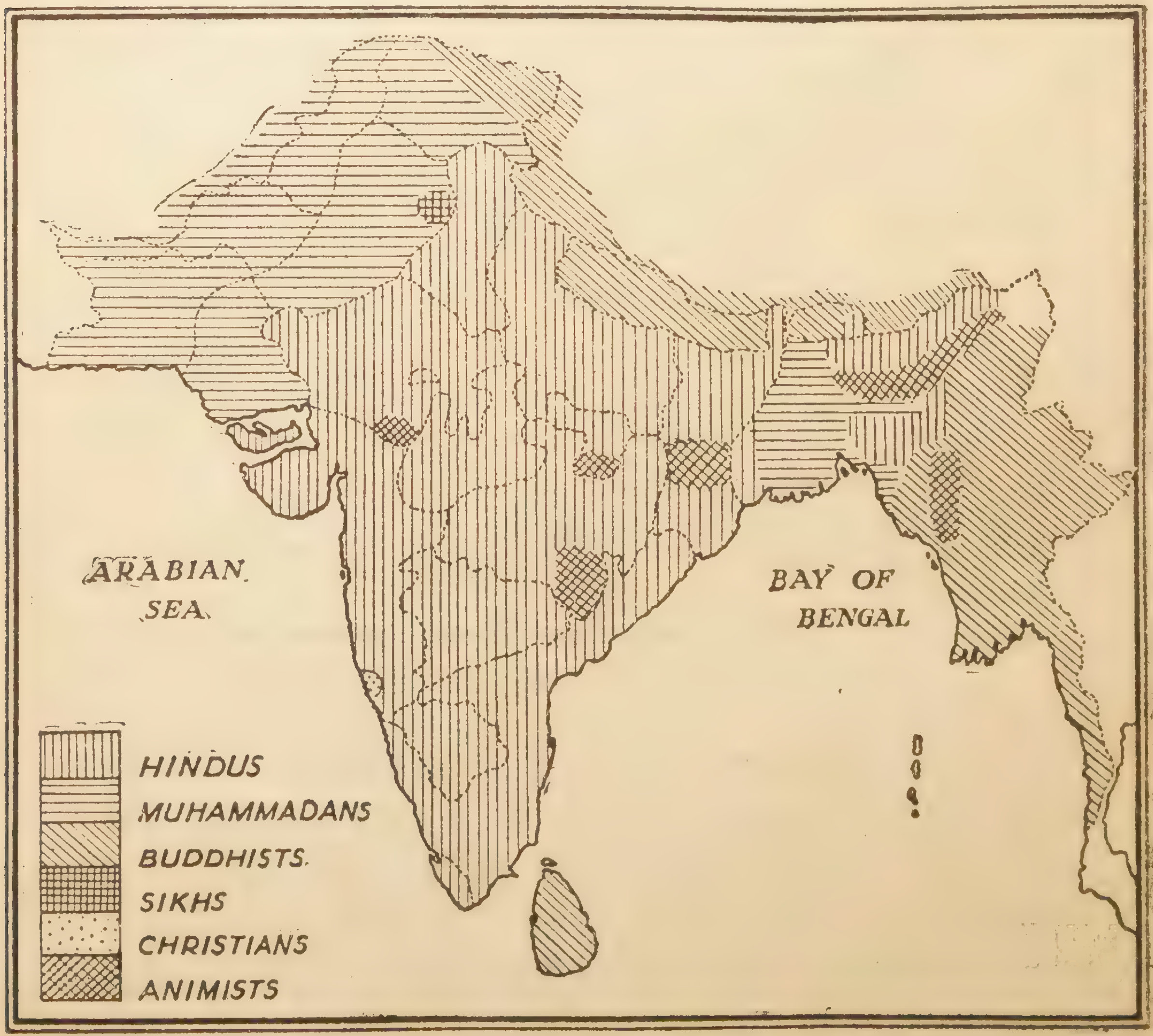

FIG. 34 THE RELIGIONS OF INDIA

under their influence, the religion of the Aryans became a mixed religion which is now known as *Hinduism*. The Hindus believe in the authority of the Vedas and consider the cow as a sacred animal. They form the majority of the population, and number about 238 million. (1931 Census).

The Turks, Afghans and Moghuls who invaded India in later times brought with them a new religion—that of Islam. Their descendants and the descendants of those whom they converted are the Muhammedans who now number about 77·7 millions. *Muhammedanism* predominates in Baluchistan, North-West Frontier Province, Kashmir and the Punjab. Why ? Bengal is another strong centre of Muhammedanism.

Buddhism was founded by Gautama in India, but almost all the Buddhists who number about 13½ millions are in Burma. The *Sikhs* (4·4 millions) are mainly in the Punjab ; and the Jains (about 1 million) in Rajputana and the neighbouring parts of Bombay. The *Parsis* are fire-worshippers who came from Persia. They number only 106,000 and are found in Bombay. *Christianity* was brought by the Europeans, and is therefore strongest near the coasts where they first settled. Christians number nearly 6 millions ; and nearly one-third of the total of the Indian Christian population is to be found in the States of Cochin and Travancore.

Many of the hill tribes are *Animists, i.e.*, they worship spirits which they believe live in the trees or the rocks. These number about 9¾ millions.

POLITICAL DIVISIONS (Fig. 35).

The Indian Empire is divided into provinces and states which are under the administration of the Viceroy who is assisted by an Executive Council, and a Legislative Assembly which passes laws. The empire includes British India, or territories which are directly under British rule, and the Native States which are under British protection. In a popular sense, it includes also Nepal and Bhutan which are entirely independent states.

Since 1912 the capital of India has been *Delhi*. For many years before that it was at *Calcutta*. British India has been divided into fifteen administrations: nine major provinces, each ruled by a Governor assisted by an Executive as well as a Legislative Council, and six minor provinces each administered by a Chief Commissioner. In the following list the first nine are the major provinces.

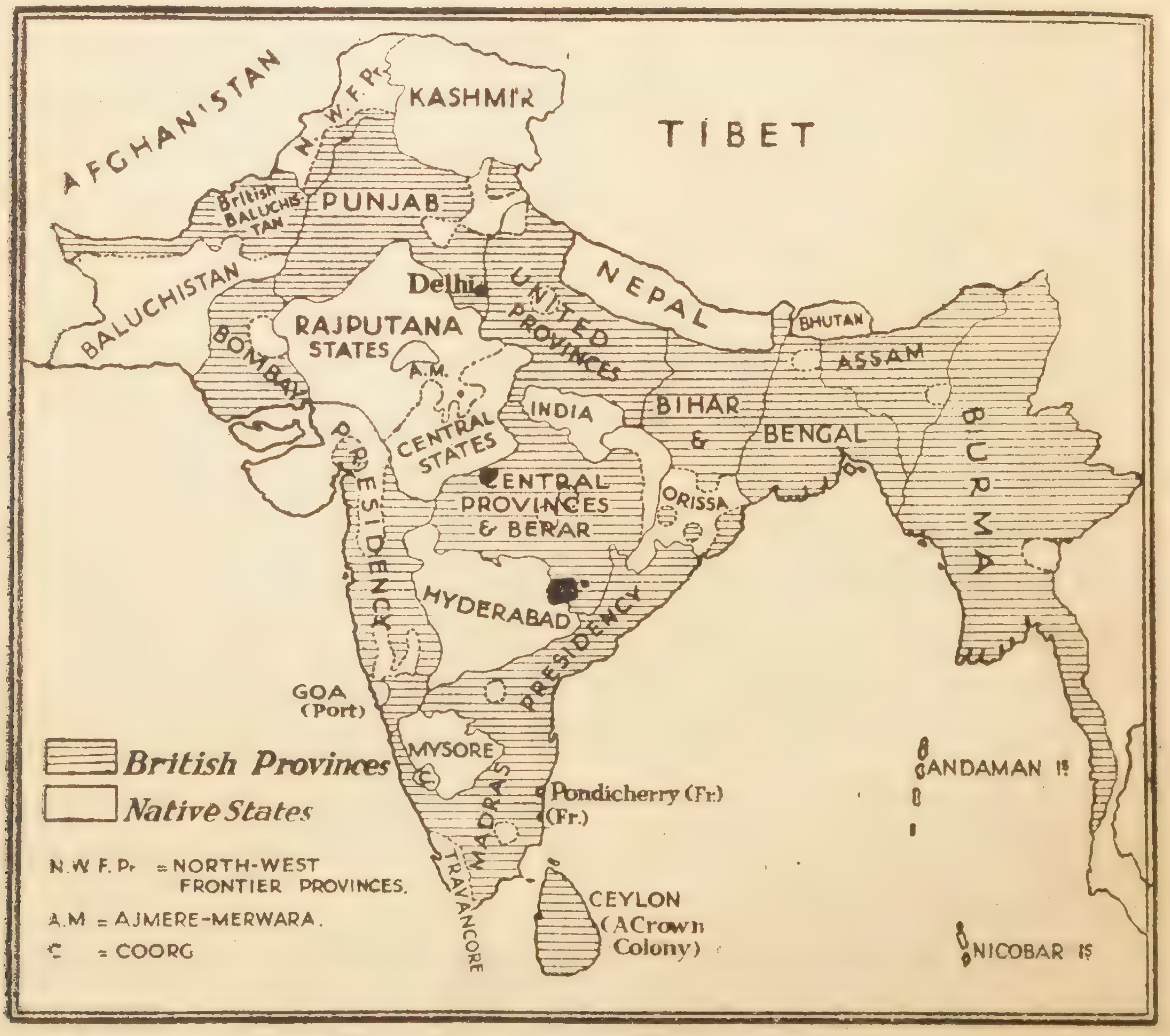

FIG. 25. INDIA: POLITICAL.

	Provinces	Area in square miles	Population according to the census of 1931
1	Madras	142,260	46,575,670
2	Bombay	123,621	21,854,841
3	Bengal	76,143	50,122,550
4	Assam	53.015	8,622,251
5	Burma	233,707	14,645,969
6	Bihar and Orissa	83,181	37,676,576
7	United Provinces	106,695	48,408,763
8	The Punjab	99,846	23,580,852
9	The Central Provinces and Berar	99,876	15,507,723
10	Ajmer - Merwara	2.711	560,292
11	Andamans & Nicobars	3,143	(1921) 27,086
12	Baluchistan	54,221	463,508
13	Coorg	1,582	163,327
14	Delhi	593	636,246
15	North West Frontier Province	13,419	2,425,076

The Native States are governed by the native princes under the political supervision of a resident or agent appointed by the Government of India. The total number of Native States is about 700, ranging from Hyderabad with an area of about 83,000 square miles and a population of over 14 millions, to small states consisting of only a few villages. The resident or agent is in charge of either a single state or a group of states. The smaller states have political relationships with the provinces in which they lie, while the larger ones deal directly with the Government of India.

States	Area in square miles	Population according to 1931 census
Assam States (Manipur)	8,456	625,606
Baluchistan States	80,410	405,109
Baroda State	8,127	2,443,007
Bengal States	5,434	973,316
Bihar & Orissa States	28,648	4,651,076
Bombay States	42,571	4,468,343
Central India Agency (150 states)	51,531	6,615,120
Central Provinces States	31,176	2.483,214
Gwalior	26,357	3,523,070
Hyderabad	82,698	14,437,541
Jammu & Kashmir	84,258	3,646,244
Madras States	10,626	6,754,484
Mysore	29,475	6,557,302
N. W. F. Province (Agencies and tribal area)	25,500	46,451
Punjab States	37,059	4,910,005
Rajputana Agency (18 States)	128,987	11,225,712
Sikkim	2,818	109,651
United Provinces States	5,949	1.206,070
Western India States.	20,882	3,999,250

EXERCISES

(1) In which parts of India is population dense, and in which parts thin? Give reasons.

(2) Find the density of population in each of the provinces and also in the following states : Baroda, Kashmir, Hyderabad and Mysore.

(3) Why does the population of India include people of different types?

(4) Represent by a diagram the comparative strength of the various religions in India.

(5) What is the difference between a political division and a natural region?

CHAPTER V

SURVEY OF THE PROVINCES AND STATES *

THE MOUNTAIN STATES (Fig. 36 & 41)

These States lie in the north-western and northern frontier of India. They are Baluchistan, the North-West Frontier Province, Kashmir, Nepal and Bhutan.

(1) **Baluchistan** is separated from the Indus plain by the Sulaiman and Kirthar ranges. It is a table-land with a very rugged surface, and is outside the influence of the monsoon. It is, therefore, nearly rainless and large parts of it are desert. The rainfall does not, on an average, exceed 8 inches in a year ; and so there are no large rivers that can be used for irrigation. Hence much food cannot be produced, and so the population is very thin. Some millet and wheat and fodder for cattle and sheep are grown. The people of Baluchistan are mainly Muhammedans, and most of them are nomads wandering about with their herds of sheep, goats, horses, cattle and camels. Northern Baluchistan is British and the southern portion consists of the large Native State of Kalat and a number of small States.

Quetta is the only town of importance, lying in a mountain valley over 5,000 feet above sea level. It guards the northern entrance of the Bolan Pass which forms the easiest route from Baluchistan to India. On account of its position it has become a strongly fortified military post,

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**N.B.*—Consult a good physical map of India when reading this chapter.

and is connected by a railway through the pass with Jacobabad on the Indus plain.

(2) **The North-West Frontier Province** lies between the Punjab and the Afghan frontier and stretches from the Sulaiman in the south to the foot of the Hindu Kush in the north. A large part of the province consists of rugged mountains separated by valleys down which rivers flow. Along the valleys of these rivers trade routes and military roads lead over passes which form gateways between Afghanistan and India. These passes have already been referred to in Chapter I. The province which was

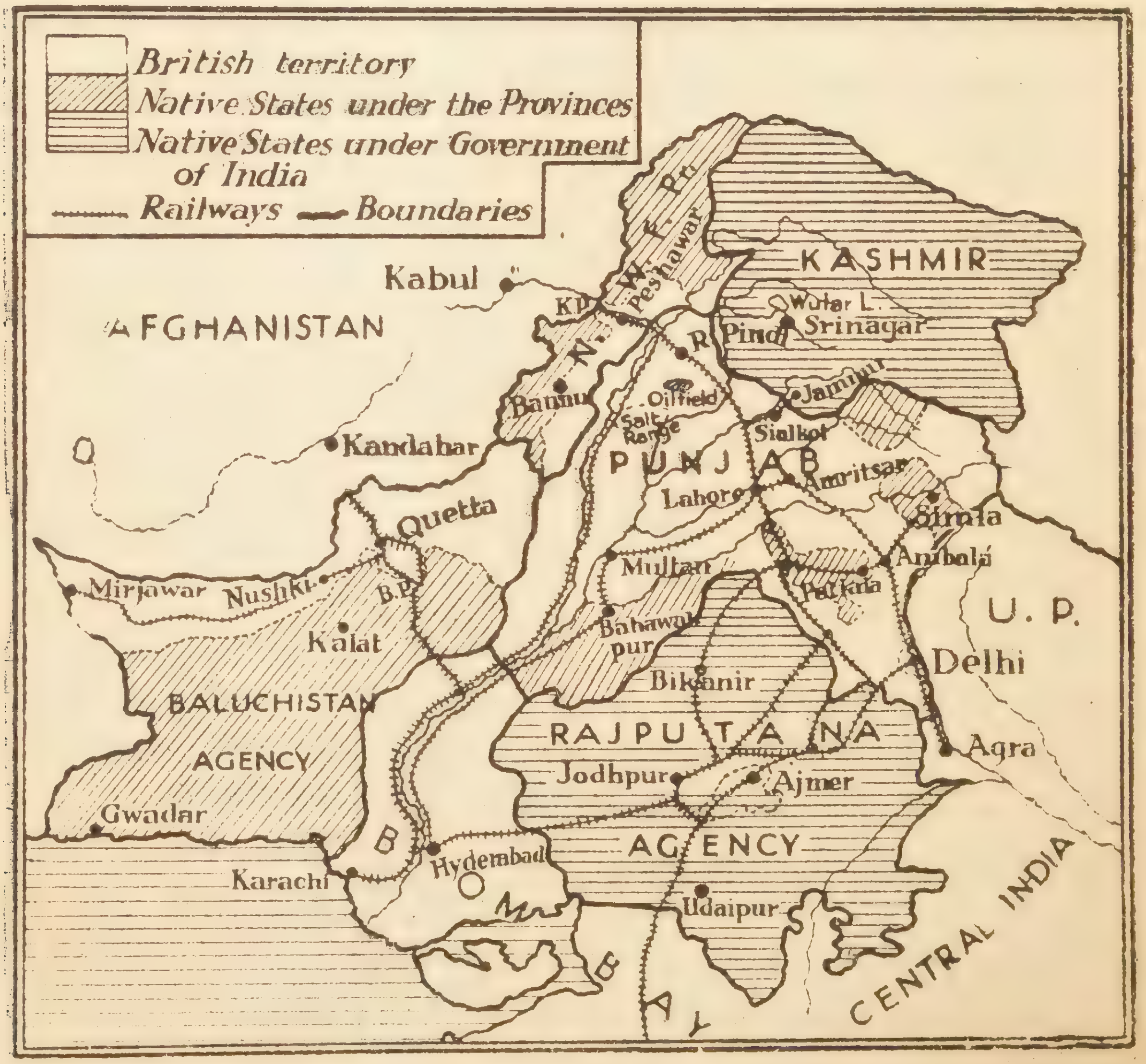

FIG. 36. NORTH-WESTERN INDIA: POLITICAL

formed in 1901 consists of three British districts and a large tract of territory inhabited by wild hill tribes. The whole of the province being outside the path of the monsoons, the rainfall is very light, and there is little cultivation except in the valleys. The most important part of the province is the Vale of Peshawar which is being irrigated by canals from the Swat and the Kabul. Wheat and millets are grown, but the province is more suited to pastoral work than agriculture. Large herds of cattle, sheep and goats are kept : and mules and donkeys are also reared.

Peshawar (104,452), the chief town on the main route to Kabul commanding the Khyber Pass, is a military centre. It is now joined with the frontier by a mountain railway up the Khyber Pass, and is also a place of large trade. *Kohat* commanding the Kurram valley, *Bannu*, the Tochi valley, and *Dera Ismail Khan*, the Gomal valley, are other frontier posts and trading centres.

(3) **Kashmir,** a large Native State under the protection of the Government of India, is made up of snow-covered mountains with many narrow valleys and one broad one, the Vale of Kashmir. The Indus and Gilgit valleys cut across the country from south-east to north-west. North of this line lie the Karakoram mountains with their highest peak Mt. Godwin Austen, and parts of the Hindu Kush and Kuen Lun forming the northern boundary. South of the line are the Inner, Middle and Outer Himalayas. The outer range of the Himalayas shuts out the monsoon, and, therefore, the rainfall is very light. The chief crops are wheat, barley, millets and pulses. The Kashmir valley is famous for its fruits, such as apples, peaches and grapes.

The chief town *Srinagar* (141,735) stands on the Jhelum close to the Wulur Lake. It is the centre of trade routes to the Punjab in the south and northern Kashmir and Tibet in the north. The manufacture of shawls is now much decayed, but a silk factory has been established. *Leh*, in the Indus valley, is the starting point of a trade route to Chinese Turkestan across the Karakoram Pass. The Kashmiris are of a nearly pure Aryan race. Muhammadans make up about three-fourths of the population which is extremely thin. Why?

(4) **Nepal and Bhutan** are independent states in the Himalayas, but they are practically under the protection of the Indian Government against the invasion of any foreign power. Nepal is a country of mountains and deep valleys along which rivers flow down to the Ganges plain. Mt. Everest, the highest peak in the world, is in the eastern half of the State. Along the foot of the Himalayas stretches the fever-haunted jungle *Terai.* In the valleys rice, millets, tobacco and oil-seeds are grown, and on the slopes are fine timber forests. Nepal takes, in exchange for its products, cotton goods, metals, salt and sugar from the plains. *Khatmandu* is the capital. This State is inhabited by *Gurkhas* who are of Rajput origin. The Gurkhas make a fine type of soldiers, and are largely enlisted in the Indian army. Besides these there are also earlier inhabitants of Mongol origin.

Bhutan is much smaller and does not include the *duars* or forest-clad tracts below the hills. It trades with Tibet rather than with India. It sends to India a little wool, lac and wax and takes cotton goods, salt and tobacco. The capital is *Punaka.* The people are nominally Buddhists.

Between Nepal and Bhutan lies the small protected state of *Sikkim.* The Chumbi valley lying between Sikkim and Bhutan forms the chief trade route between India and

Tibet. *Gangtok* is the capital. Sikkim produces rice, millets, cardamoms, oranges, apples and woollen cloth.

THE GREAT PLAIN (Fig. 35 & 38)

The Great Plain of Northern India includes the greater part of the Punjab, the United Provinces, Bihar and Orissa, nearly the whole of Bengal and the Valley of Assam. Sind forms part of the plain, but it will be considered later under Bombay.

(1) **The Punjab** (Fig. 36) : In the north it includes a small table-land beyond the Salt Range, and in the north-east it extends into the Himalayas as far as the point where the Sutlej enters India. The rest of the province is a broad alluvial plain sloping gently south-west-wards. This plain is watered by the Indus and its five tributaries. In the dry season the rivers are shallow, but in the rainy season they are flooded owing to the melting of the snow on the mountains and to the monsoon rains on the Himalayan slopes. The whole of the Punjab is dry, but it is driest in the south-west where the rainfall is less than 5 inches. Hence the Punjab plains would be uncultivated without irrigation. In fact, the Punjab is a province of many irrigation works (Fig. 26). About 60 per cent of the plains are irrigated. In the hot season millets, pulses, sugar-cane, (long-stapled American) cotton and some oil-seeds and rice are grown ; in the cold season wheat and barley are the chief crops. The most important crop is *wheat* which occupies nearly one-third of the total cultivated area. Every year large quantities of wheat are sent to Europe through the port of Karachi,

Lahore (281,781), the capital, on the Ravi, is the largest city of the province and an important railway centre. *Amritsar* (160,218), the holy city of the Sikhs, is a busy trading town. *Rawalpindi* (10,142) on the railway from Lahore to Peshawar is a garrison town. *Multan* (84,806) on the railway to Karachi is a trading centre where the Afghan traders exchange their fruits, dates and spices for piece goods. *Ambala* is a railway junction. *Simla*, the chief hill station, is the summer capital of the Government of India.

(2) **Delhi** (304,420), the capital of India, with a small district round it now forms a separate province. It was the capital of the Moghul Emperors and so contains many palaces and mosques. Its importance is due to its position (Fig. 37) on the Jumna where the two great plains of the north meet. Invaders from the north-west had to pass through or near Delhi to reach the rich Ganges valley,

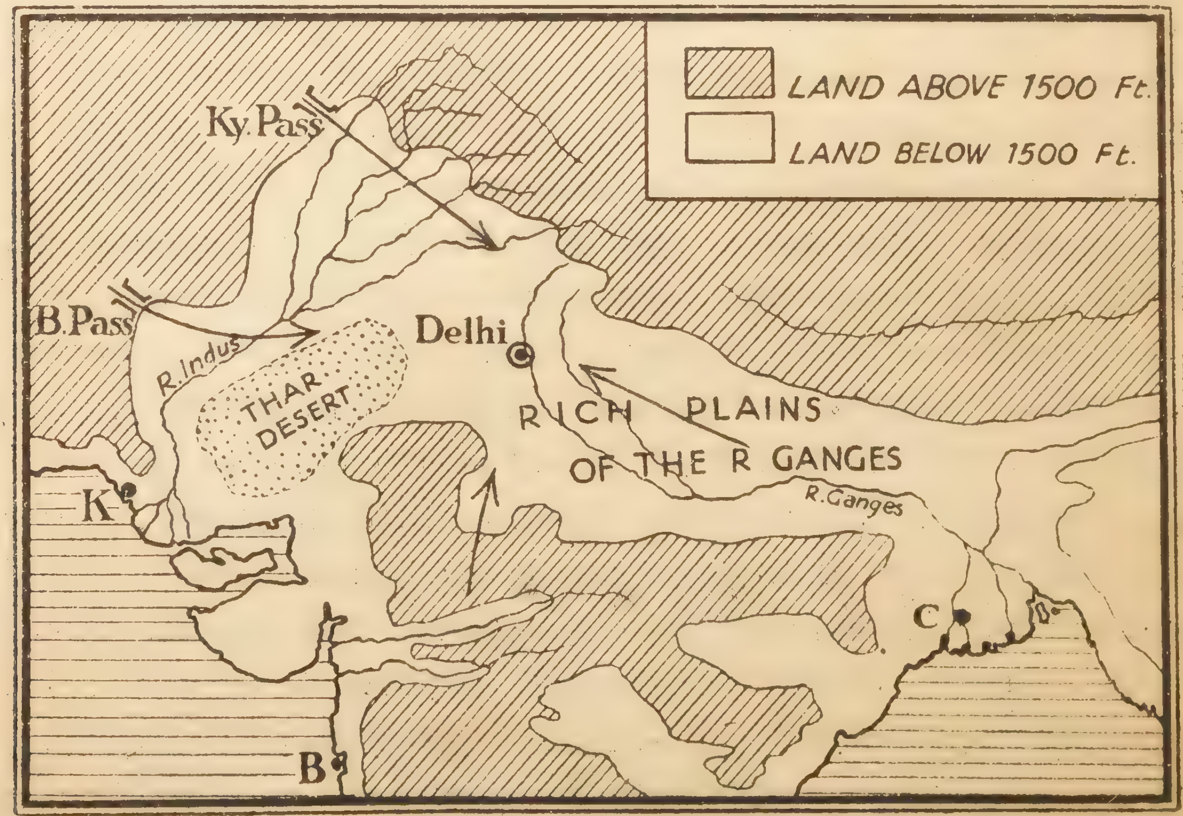

FIG. 37. POSITION OF DELHI

for in the north they were prevented by the Himalayas, and in the south, by the Thar Desert. Hence Delhi was made the capital from where the rulers could control all parts. Now it is the centre of many railways, and can be reached from all parts of India. A *New Delhi* has now been built with courts and offices for the use of the Imperial Government. Delhi is also a busy trading and manufacturing town with cotton, flour and sugar mills.

(3) The United Provinces (Fig. 38): The north-western part of the Provinces stretches into the Himalayas and a small strip in the south forms part of the slope from the Central India plateau. But the largest and the most important part of the province lies in the Ganges Plain. In a large part of the province, the rainfall is less than 40 inches a year and, therefore, the prosperity of the province is due to the irrigation works—the Ganges and Jumna canals and the Sarda River Canal. Nearly 69 per cent. of the Upper Ganges Valley are cultivated. The chief crops are wheat, barley, millets, rice, maize, pulses and sugar-cane. Wheat and millet are more important than rice; wheat is usually a 'winter' crop. Cotton of the American variety is also grown on the irrigated lands. Owing to the large production of food-crops, the United Provinces are more densely populated than any other province of India except Bengal.

Allahabad (157,220), the capital of the province, is at the junction of the Ganges and the Jumna. It is a busy trading town, and also an important railway centre. It is the holy *Prayag* of the Hindus and so is a place of pilgrimage. *Agra* (185,532), an old town and trading centre on the Jumna, contains many beautiful buildings of which the most famous is the Taj Mahal (Fig. 39). It has cotton mills and leather and boot factories. *Lucknow* (240,566), on the Gumti, the capital of Oudh, is a railway centre. *Cawnpore* (216,436), on the Ganges, is a modern town owing its importance to its manufactures of cotton, woollen and

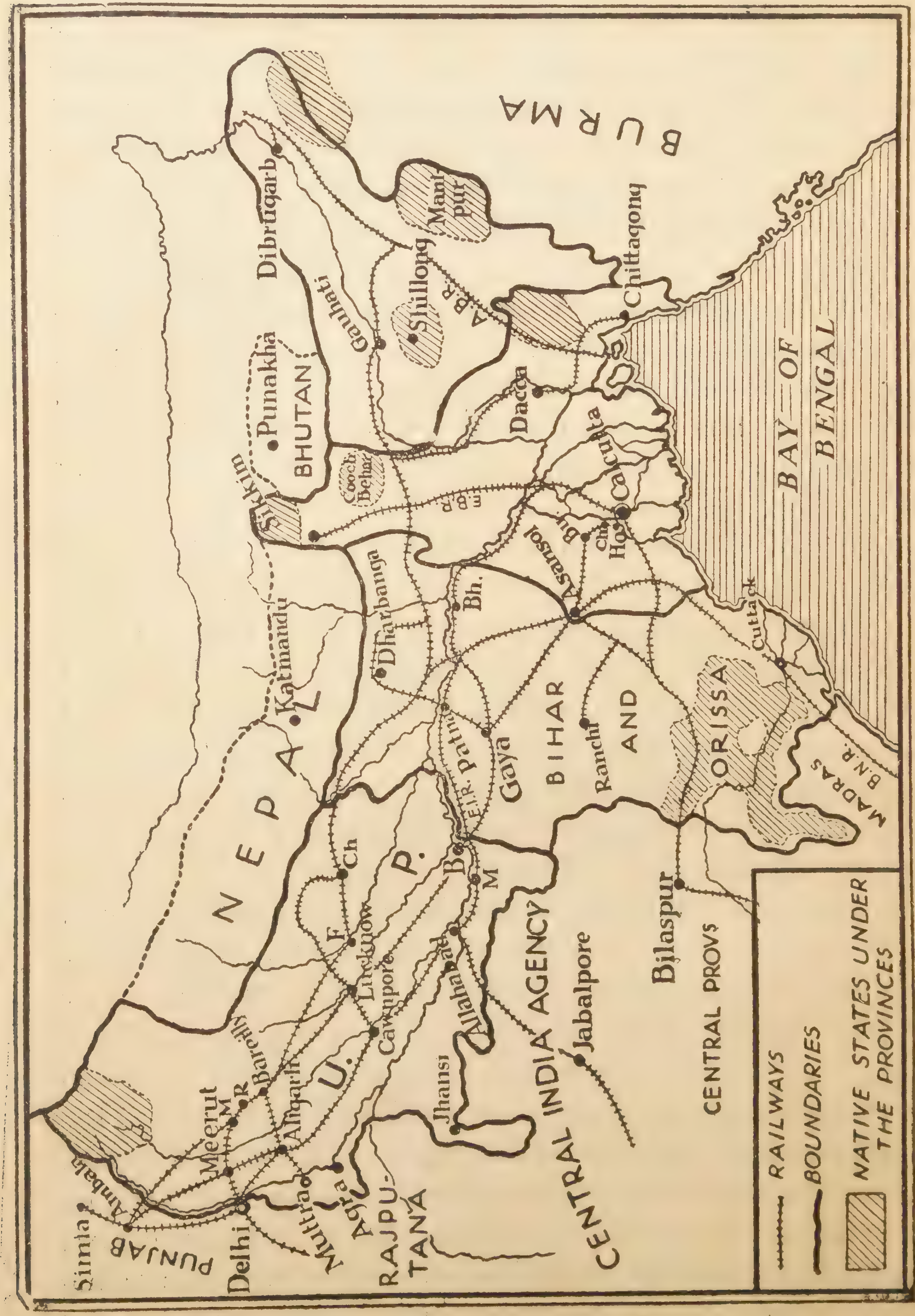

FIG. 38. UNITED PROVINCES, BIHAR AND ORISSA, BENGAL, ASSAM, NEPAL AND BHUTAN

leather goods. *Benares* (198,447), on the Ganges, is an old town and a famous place of pilgrimage. Brass vessels, silk-cloths, and jewellery are made here. *Naini Tal* and *Mussuri* are two of the hill stations in this province.

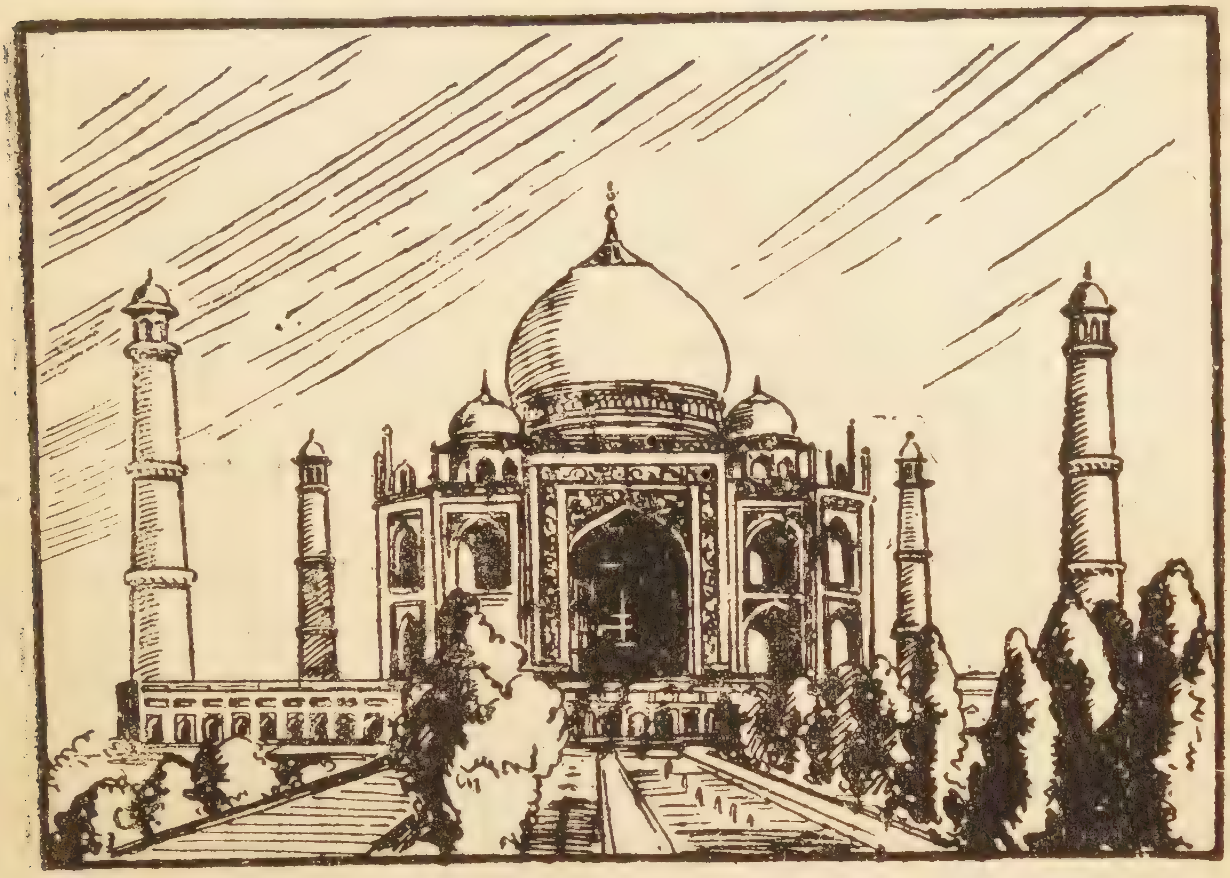

FIG. 39 THE TAJ MAHAL

(4) **Bihar and Orissa** (Fig. 38): The province (created in 1912) extends from the foot of the Himalayas to the delta of the Mahanadi, and falls into three natural regions:—(1) the Middle Ganges valley, or Bihar; (2) the Chota Nagpur plateau; and (3) the Mahanadi valley and delta.

Of these, the most densely peopled part is the Middle Ganges valley. Nearly three-quarters of this region are cultivated. The narrow strip of plain south of the Ganges is somewhat drier than the northern plain, and here the Son river is used for irrigation. The main crop is rice, but maize, tobacco, oil-seeds, indigo and some jute are also grown. Wheat and barley are winter crops, but they are grown in small quantities. *Patna* (120,000), on the right bank of the Ganges, is the seat of the government of Bihar and Orissa. As the Gogra, the Gandak, and the Son enter the Ganges close to the town, it had a good river trade. It is an important collecting centre for agricultural produce. *Gaya* (67,500), south of Patna, is a place of pilgrimage for Hindus, and near it is *Buddha Gaya* with its sacred pipal tree. At *Monghyr* there is one of the largest cigarette factories in the world.

The Chota Nagpur plateau consists of forest-covered country inhabited by backward tribes. In the river valleys rice can be cultivated, but on the hill sides maize, millet, oil-seeds and pulses can be grown. Only a small portion of the region is cultivated. In the forest parts lac is collected. On the edges of the plateau in the Damodar valley are some valuable coalfields (*Vide* Fig. 8). *Hazaribag* and *Ranchi* are important towns in this region.

In the third region nearly two-thirds of the total area are cultivated, and rice occupies more than 80 per cent of the cultivated land. *Cuttack*, at the head of the Mahanadi delta, is a centre of trade by rail, river and canal. *Puri*, on the southern side of the delta, contains the famous temple of Jagannath, and is a place of pilgrimage.

(5) **Bengal** (Fig. 38): Bengal is a flat, triangular, low-lying alluvial plain with rivers flowing from east and west. Nearly the whole of Bengal consists of the Lower Ganges valley and the Deltas of the two mighty rivers, the Ganges and the Brahmaputra. The rainfall is heavy, nearly everywhere over 60 inches, so that 60 per cent of the total area is under cultivation. No irrigation is necessary. *Rice* is by far the most important crop, and occupies nearly three-fourths of the whole cultivated area. Another

important crop is *jute* ; in fact, Bengal is the most important jute-growing region in the world. Oil-seeds, pulses and sugar-cane are also grown. *Tea* is cultivated on the hills round Darjeeling. Bengal is the most thickly populated part of India, with nearly 600 people to the square mile. Nearly 75 per cent of the people are engaged in agriculture (rice and jute) and 8 per cent in industry. There are three chief industries in Bengal :—(1) the spinning and weaving of jute in factories on the banks of the Hooghly ; (2) the preparation of tea at Darjeeling, and (3) the mining of coal round Raniganj. There are few large towns : most of the people live in villages.

Calcutta (with suburbs, 1,327,547), on the left bank of the Hooghly, is the largest city in India and the second largest city in the British Empire. It was the capital of India till 1912, and is still the 'commercial capital' of the country. Figure 40 shows the position of Calcutta. All the products of the rich *hinterland* can easily reach the city by roads, rivers or railways. It is also a great manufacturing centre, its chief manufacture being jute; for it is very near the jute-growing area, and also close to the Raniganj coalfield. There are also cotton mills, paper mills, sugar factories and iron foundries. The East Indian Railway connects it with all the towns up the Ganges valley, and the Bengal Nagpur Railway with Bombay and Madras. *Dacca* (119,460), at the head of the Meghna estuary, is an old city which was once famous for its muslins. Now it is a collecting centre for jute and rice. Near *Raniganj* in the valley of the Damodar river, a busy centre of coal mines, is *Asansol*, the railway junction from which coal is sent in all directions. *Chittagong*, on the east of the Ganges delta, is a busy seaport connected by a railway with the valley of Assam.

(6) **Assam**, like Bengal, is a wet "triangle"; but it is not flat, but full of hills. It falls into three distinct

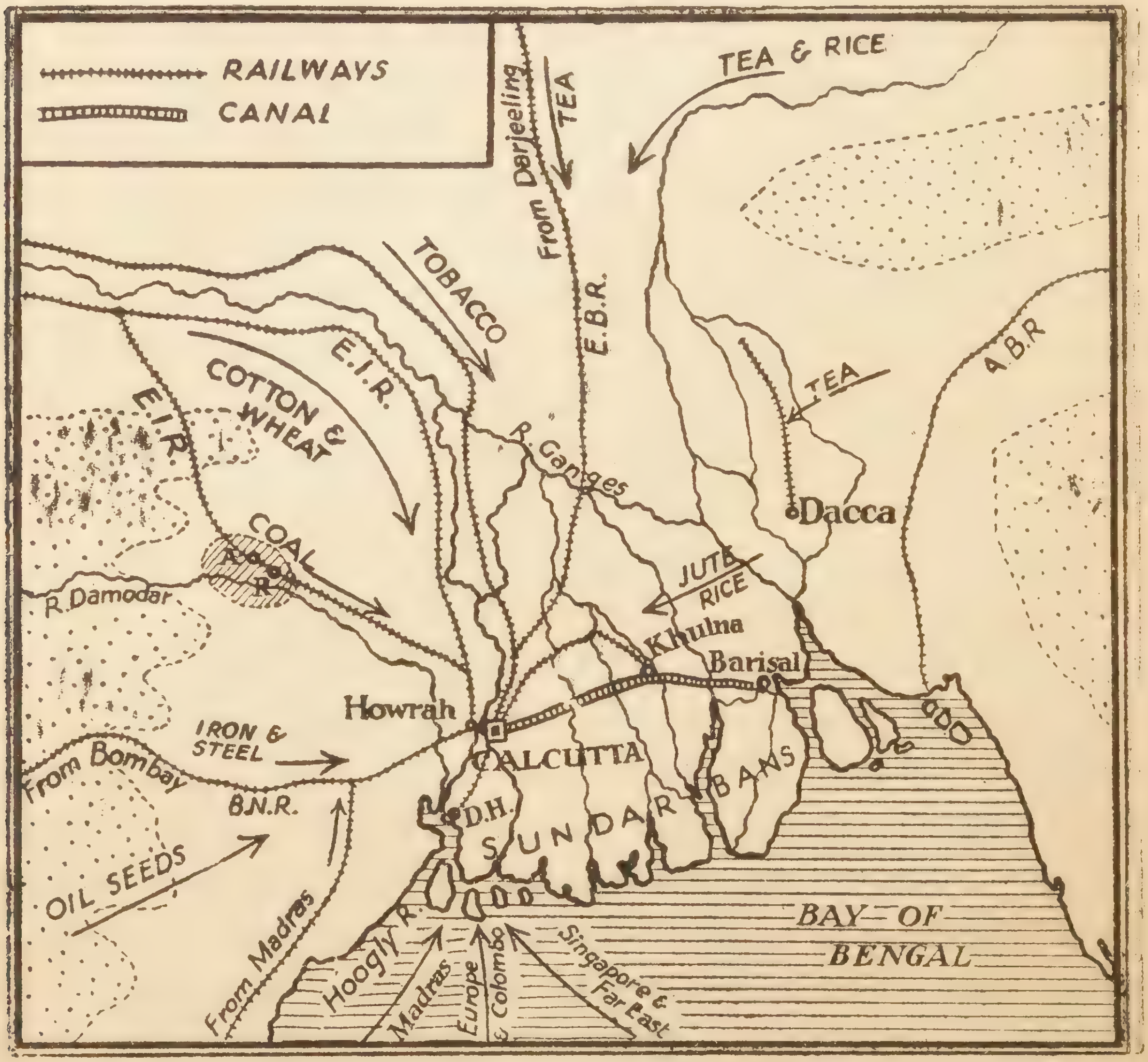

FIG. 40. POSITION OF CALCUTTA
(Dotted areas represent highlands)

Note the network of waterways between the Hooghly and the Ganges and how these are linked up by railways and canals.

regions :—(1) the Brahmaputra valley ; (2) the region of hills ; and (4) the Surma valley. The rainfall in the Brahmaputra or Assam valley is more than 80 inches except in the centre which is drier. Why? Only one-fifth of the valley is now under cultivation, and rice occupies the largest area and forms the principal food of the people. The damp well-drained hill slopes are covered with tea gardens. Assam produces two-thirds of all the tea grown in India. Oil-seeds and jute form other important crops. There is a greater extent of forest-land in Assam than in any other province in India except Burma. Coal and oil are obtained near Makum. The population is thin when compared with the other provinces of the plain; but it is rapidly increasing as large numbers of Bengalis and Biharis are coming every year to settle here. All the towns in the valley are river ports sending down the river tea and timber. The capital of the province, is *Shillong*, high up in the Khasi Hills. *Sylhet* is the largest town, around which lie the tea plantations of the Surma valley.

THE PLATEAU STATES AND PROVINCES

(1) **Rajputana** (Fig. 36) is an agency, or group, of 18 Native States, lying between the Indus plain and the Central India plateau. The Aravalli Hills running south-west to north-east divides Rajputana into two parts. The western portion is very dry and slopes gently to the Indus valley and the Thar desert. Hence many of the people live a nomadic life wandering with their cattle, sheep and camels in search of pasture. But the eastern part gets more rain and is watered by the Chambal and its tributaries. Here millets, oil-seeds, wheat and barley are grown. *Jaipur* (120,200), *Alwar*, *Bharatpur* and *Udaipur* are some of the Rajput capitals in the north-east and south-east. *Jodhpur* (74,480) and *Bikaner* (69,410) are in the dry west.

On a table-land of the Aravallies lies *Ajmer* (113,500), the capital of the small British province of Ajmer-Merwara. It has textile industries and railway workshops.

(2) **The Central India Agency** (Fig. 41): East of Rajputana and south of the United Provinces lies the

Central India Agency, a federation of several Native States, the chief of which are Gwalior, Bhopal and Indore.

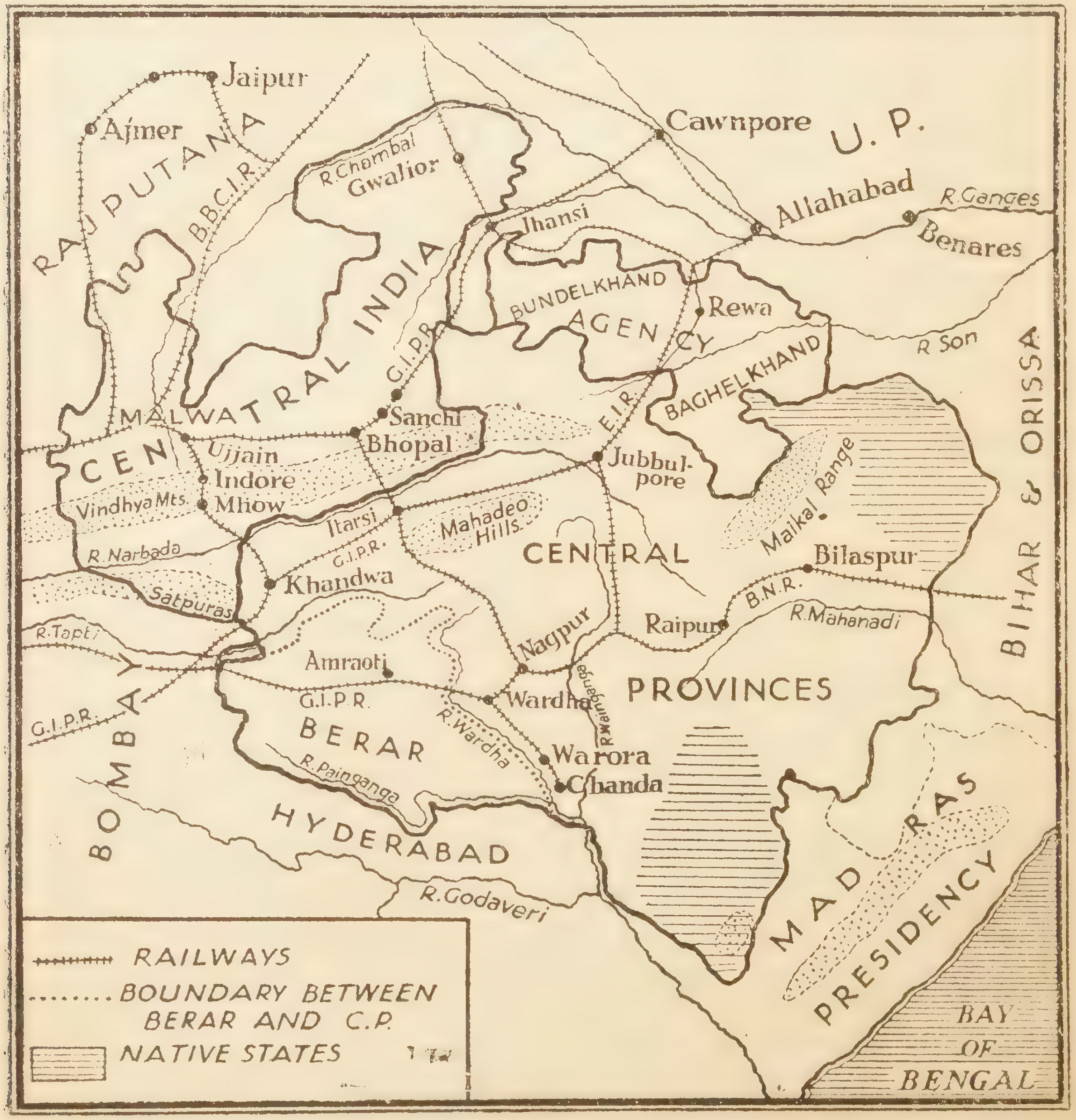

FIG. 41. CENTRAL PROVINCES AND BERAR AND THE CENTRAL INDIA AGENCY

Gwalior, *Bhopal* and *Indore* are the capitals of the respective states. Near *Bhilsa* is the famous Buddhist tope of Sanchi.

(3) **The Central Provinces and Berar** (Fig. 41): These occupy almost the centre of the table-land. They are the birth place of several rivers, the Narbada, the Tapti, the Mahanadi and some of the feeders of the Godavari.

Note: In the map read *within the Provinces* after *Native States.*

The valleys of these rivers are the most fertile parts of the province where rice and cotton are cultivated. In the drier parts millets, pulses and oil-seeds are grown. Wheat is a winter crop in the Narbada valley. Berar is a region of black soil growing large crops of cotton.

Nagpur (145,000), on the Bombay-Calcutta railway, is the capital of the Central Provinces. It has large cotton mills which are supplied with raw material from the neighbouring districts. *Wardha*, *Hinganghat*, *Warora* and *Chanda* in the Wardha valley have spinning mills. *Amraoti* in Berar is another cotton manufacturing town. *Jubbulpore* is a great railway centre where the East Indian Railway from Allahabad joins the Great Indian Peninsular Railway from Bombay. It has cotton, oil and flour mills. *Raipur* in the south-east has rich deposits of iron ore.

(4) **Hyderabad** (Fig. 42): South of the Central Provinces and Berar lies Hyderabad or the Nizam's Dominions. The Godavari, with its feeder the Penganga, forms its north-eastern and northern boundary, and the Krishna, with its tributary the Tungabhadra, forms its southern boundary. The valleys of the rivers flowing through the State are fertile and grow rice, but on the table-land only dry crops such as millets and oil-seeds are grown. The western half of the state is covered with the black cotton soil which favours the growth of cotton and wheat. Some coal is mined at *Singareni*. In the western half of the state Marathi is spoken, but in the eastern half, Telugu. *Hyderabad* (404,187), the capital of the State, is the fourth largest city in India. Close to it is *Secunderabad*, a large military station.

(5) **Mysore** (Fig. 42): This is the highest part of the Deccan and is flanked east and west by the Eastern and Western Ghats. Rivers flow in all directions except to the

west. The Tunga and Bhadra forming the Tungbhadra flow northward, the Palar and South Pennar eastward, and the Cauvery and its feeders southward. A great part of the state is dry and the Cauvery is used to irrigate a large area. Rice and sugar-cane are grown in the irrigated valleys ; millets and oil-seeds in other places. Ragi is the staple food of the people. Cotton is grown in the black soil of the north, and coffee and cardamoms on the Ghats. *Bangalore* (237,500) in the south-east, is an important railway centre. It is a military cantonment and seat of government. It has cotton and silk manufactures. *Mysore* (83,950), the capital of the state, has also silk factories. *Kolar* is famous for its gold mines, where the rock containing gold is crushed by machinery driven by electricity generated by the Sivasamudram Falls.

(6) **Coorg** is a very small British Province lying to the south-west of Mysore. Its capital is *Mercara*. Rice is cultivated in the valleys, and coffee and cardomoms on the hills.

THE PRESIDENCY OF MADRAS (Fig. 42)

This is the most southerly of the provinces of India, and has a longer coast-line than any other province and, consequently, more seaports. It is made up of three natural regions :—

(1) **The East Coast Plain,** extending from Lake Chilka to Cape Comorin, and from the Bay of Bengal to the line of the Ghats ;

(2) **The West Coast Strip,** lying between the Arabian Sea and the Western Ghats or Cardamom Hills.

(3) **Madras Deccan,** called the *Ceded Districts*, lying between the Eastern Ghats, the Krishna River and Mysore.

The northern part of the east coast plain is known as the *Northern Circars* Region, and the southern part the

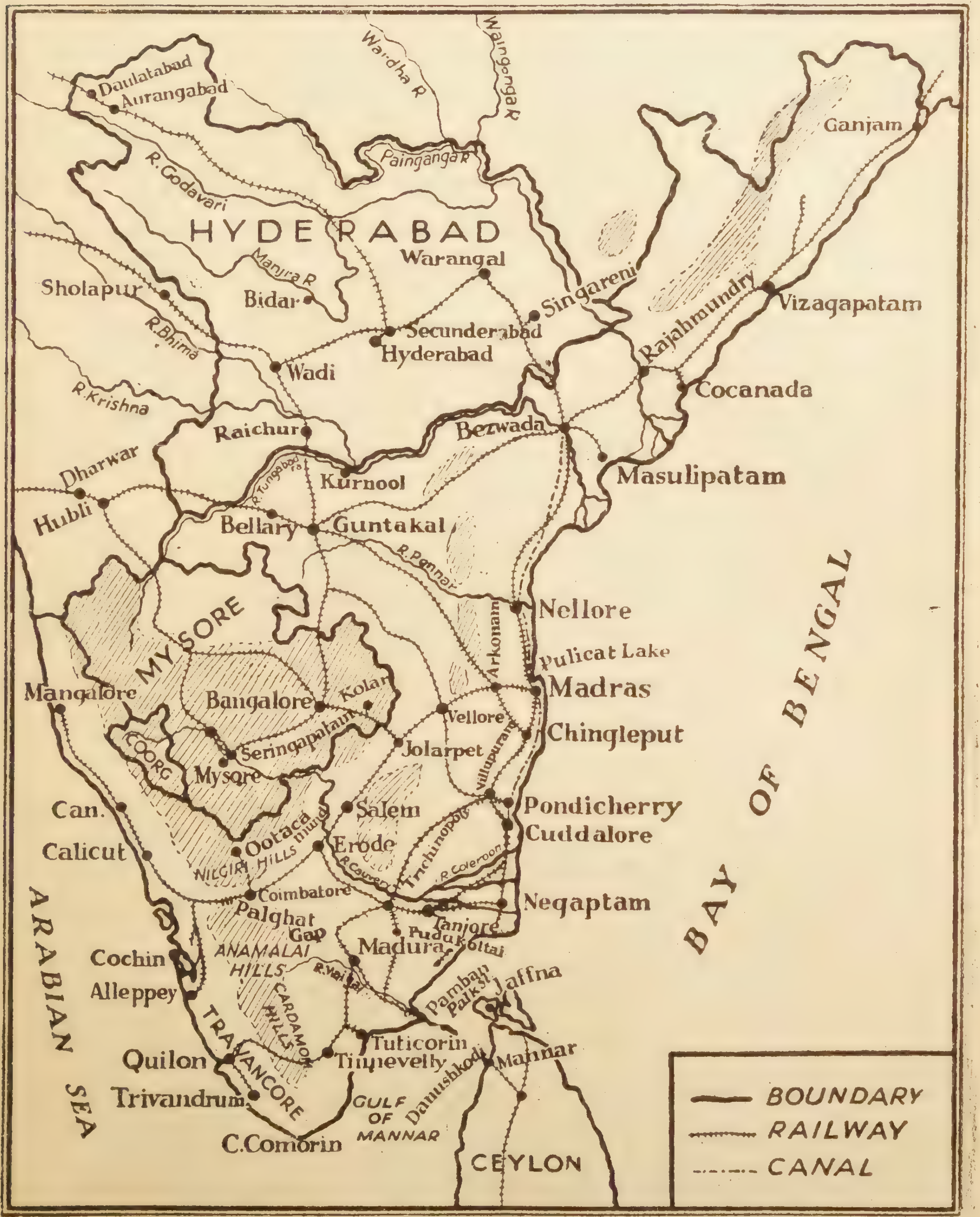

FIG. 42. THE MADRAS PRESIDENCY-MYSORE AND HYDERABAD

Carnatic Region. The southern region is much broader than the northern. The flat lowlands are of alluvium, but the hills are of crystalline rock. The central parts of the Northern Circars is made up of the big deltas of the Godavari and the Krishna. The Carnatic region has many rivers, the most important being the Cauvery. Almost all the east-flowing rivers are used for irrigation.

The streams on the west coast are short and swift, and, therefore, they are of little value for irrigation or navigation. But many of them can be used to float down logs of timber from the forests of the Ghats to the coast. There are three distinct features in the West Coast Region : (1) the sand dunes along the coast ; (2) the flat alluvial land behind the sand dunes wherein lie many shallow lagoons or backwaters connected by canals ; and (3) the slopes of the Western Ghats covered with dense forests.

The climate of Madras is generally very hot. The west coast gets the full benefit of the south-west monsoon. The Carnatic receives its rainfall chiefly in the winter monsoon. In the Northern Circars the rain falls during the south-west monsoon. The Ceded Districts get very little rain, and often suffer from drought.

Nearly two-thirds of the coastal plain is cultivated. *Rice* is the most important crop grown wherever sufficient water can be had. The chief areas are (1) on the west coast where rainfall is heavy ; (2) on the east coast in the deltas of the Godavari, the Krishna and the Cauvery, and on the banks of the rivers with irrigation channels, *e.g.*, the Palar, Cheyyar and Tambraparni ; and (3) under tanks, of which there are hundreds in the Presidency. The *Periyar Project* is the most important of the irrigation works completed by the Government in the Carnatic region. *Sugar-cane* is also grown on the irrigated lands. *Millets*, *maize*, *pulses* and *oil-seeds* (especially *groundnuts*) are the chief dry crops. *Cotton* is grown on the black soil of the Tinnevelly, Coimbatore and Bellary districts. *Tea* is cultivated on the slopes of the Nilgris and the Western Ghats. Teak, ebony and sandal-wood are the important trees of the forests. On the Western Ghats spices, such as *pepper* and *cardamoms*, are found. On the sand-dunes and around the lagoons of the west coast, the *coconut* thrives well. The coconut is very important to the people of the west coast, for their houses are thatched with its leaves and they use its wood for building and for firewood. From the fibre of the husk of the coconut, *coir* is made, and the dried kernel forms the *copra* from which coconut oil is extracted. The *palmyra* is found in large numbers in the drier eastern plain. *Rubber* planting is becoming important in Travancore.

Mica is mined in Nellore, and *manganese* near Vizagapatam. No coal is found in this Presidency; hence there are no large industrial centres like Bombay or Calcutta. Cotton spinning and weaving are done in the cotton mills in Madras and in the cotton-growing districts. The Tinnevelly Cotton Mills at *Papanasam* use water power, while the others use steam power. The *Pykara-Hydro Electric Scheme*, when it becomes an accomplished fact, may supply electric power to some of the mills near by. Along the east coast salt is obtained from the sea. *Pearl-fishing* is an important industry in the Gulf of Mannar, and fishing is common all along the coast. On the west coast there are many tile-works.

Towns: *Madras* (526,911), the third largest city in India, is the capital of the Madras Presidency. Its harbour is deep, but it is entirely artificial. As a port it cannot compare with Bombay, Calcutta, Karachi or Rangoon; for its hinter-land is not rich and it has to compete against many small ports on both the east and west coasts. It has a few cotton mills, and tanning of hides and skins is an important industry. Figure 43 shows the position of Madras. The city is connected by railway with Calcutta, Bombay, the west coast, and the southern districts. The other ports of importance on the east coast are *Vizagapatam*, *Cocanada*, *Pondicherry*, *Negapatam* and *Tuticorin*. *Vizagapatam*, sheltered by a headland called the Dolphin's nose, will have a deep water harbour in the near future. *Cocanada* is the outlet for the Godavari delta. *Pondicherry*, the capital of the French possessions in India, exports groundnut. *Negapatam* is the outlet for the Cauvery delta. *Tuticorin*, famous for its pearl fisheries, has a regular service of steamers to Colombo.

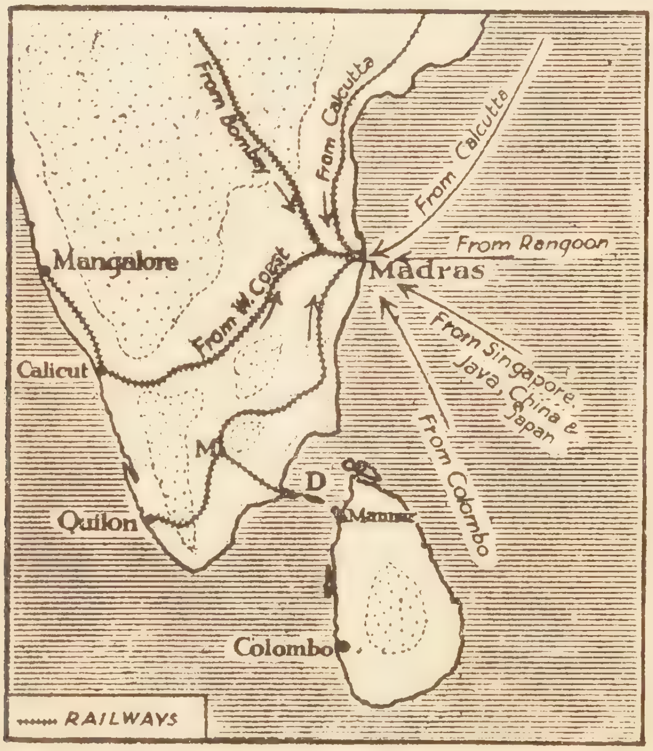

FIG. 43. THE POSITION OF MADRAS

Madura (138,894). *Trichinopoly*, (170,422), *Tanjore* and *Tinnevelly* are inland towns, famous for their temples, and are busy railway centres. *Rameswaram*, *Srirangam*, *Kumbakonam*, *Chidambaram* and *Conjeevaram* are other temple towns which are all important places of pilgrimage.

On the west coast, *Mangalore* exports coffee. *Calicut* has a soap factory and some timber trade. *Cochin* has a bright future as its harbour is being deepened. *Alleppey* and *Quilon* (in the Travancore State) are growing industrial centres where coir ropes and mats are made. *Trivandram*, the capital of Travancore, has now railway connection with Madras. The west coast ports generally send the raw products (copra, coir, rice, pepper, tea, coffee and timber) to big ports like Bombay or Colombo. Why ?

Bellary, the largest town in the plateau districts of the Presidency, is a cotton centre. *Ootacamond*, the finest hill station in India, is on the Nilgiri Hills. It is the summer resort of the Madras Government and is reached by a railway.

THE BOMBAY PRESIDENCY (Fig. 44).

This Presidency is very irregular in shape, and extends inland from the Arabian Sea for a distance of 200 to 300 miles. The northern half of the coast is flat and low, and is broken by the delta of the Indus and the shallow waters of the Ranns and Gulf of Cutch and by the Gulf of Cambay. The southern half of the coast is almost regular except for the harbour of Bombay. The coast here is not flat, for close behind it rise the Western Ghats. The Bombay Presidency falls into four natural regions :—

(1) **Sind :** This lies between the Kirthar Range and and the Thar Desert, and occupies the Lower Indus valley. This is a very dry region, the rainfall in some places being less than five inches in the year. Were it not for the Indus, Sind would be a desert. Cultivation is carried on along the banks of the Indus, the chief crops being rice and cotton. In the past irrigation has been by *inundation canals*, but now that a great dam has been built across the Indus at *Sukkur* (known as the *Sukkur Barrage*), the country will be irrigated by *perennial canals* in the near future. Just as Egypt is called, 'the gift of the Nile' so Sind may be called 'the gift of the Indus'.

(2) **Gujarat** including Kathiawar, Cutch and the State of Baroda: This region gets more rain during the monsoon than Sind. The most fertile parts of Gujarat are

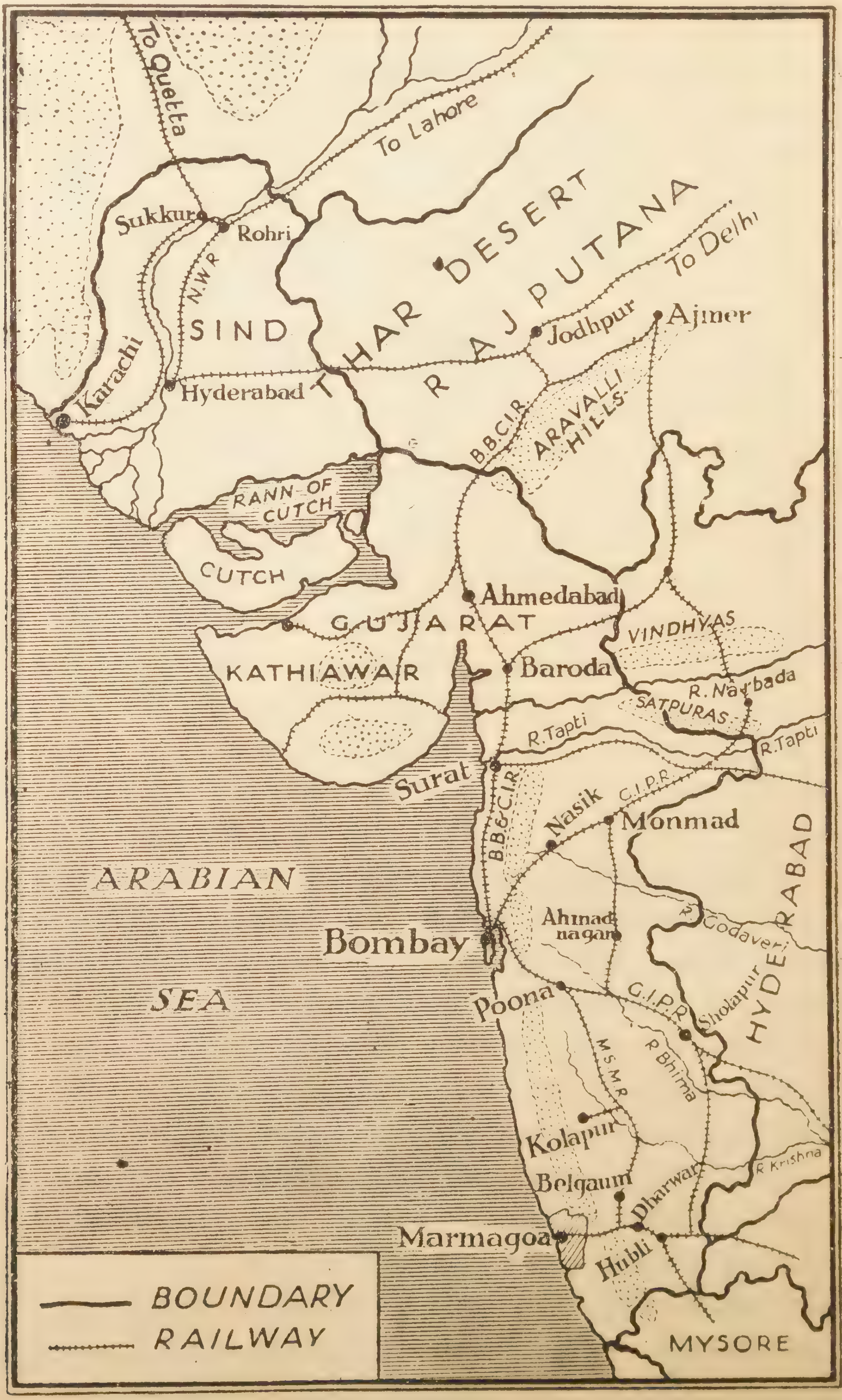

FIG 44. THE BOMBAY PRESIDENCY

near the Narbada, but, in the north, the rainfall is low and the soil is sandy. On the coast lands millets and pulses grow; but on the rich black soils in the interior, rice, cotton and sugar flourish. Wheat is grown as a winter crop. Kathiawar has forest-covered hills in the centre, but much of the country is barren. Cutch is drier than Kathiawar, and is a useless country.

(3) **The Konkan Coast,** *i.e.*, the narrow coast strip between the Ghats and the sea south of the mouth of the Tapti. The coast line is very straight and there are few inlets that can be used as harbours. But the Bombay harbour is due to the protection of the island of Bombay. This region gets plenty of rain during the south-west monsoon and is crossed by many short rivers flowing from the Ghats which, in the future, may be used for generating electricity. The heavy rain on the west slope of the Western Ghats which was all running to waste, has now been used to good purpose. Stone dams have been built in the Ghats behind Bombay to catch and store the monsoon rain. The water thus stored is used to generate electricity which is taken by wires to Bombay to drive the cotton mills and light the lamps of the city. This is known as the *Tata Hydro-Electric Works.* The West-Coast region is a country of rice-fields and coconut palms. The hill-slopes are covered with dense evergreen forests.

(4) **The Bombay Deccan.** This is part of the great Lava region, where the black soil is particularly suited to *cotton.* Nearly a quarter of the cultivated land is devoted to this crop. This region is in the rainshadow of the Ghats, and, so, the rainfall is less than 40 inches. Hence the crops are nearly all dry crops, millets and pulses being the chief. Millets form the staple food, and cover nearly half the cultivated land. Conditions have been much improved

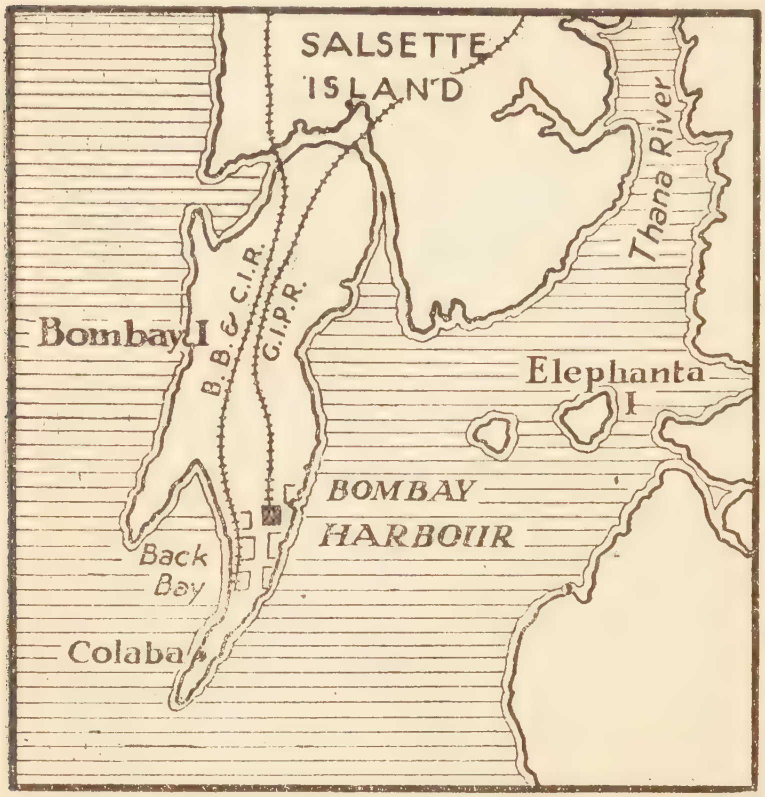

FIG. 45. BOMBAY ISLAND AND HARBOUR

by the *Bhandardara Irrigation Works.* This region is drained by the head streams of the Godavari, the Bhima and the Krishna.

Towns: *Bombay* (1,175,914), the capital of the Presidency, is the most important seaport on the west coast of India, with a spacious natural harbour (Fig. 45) protected by the island on which the city is located. It is nearer to Europe than any other port in India except *Karachi.* It lies close to the great cotton-growing Black Soil Region, and is, therefore, the centre of cotton manufactures. The moist climate of the west coast is advantageous for the spinning of cotton, and the cotton mills are driven by electricity supplied by the Tata Hydro-Electric Works. The city is con-

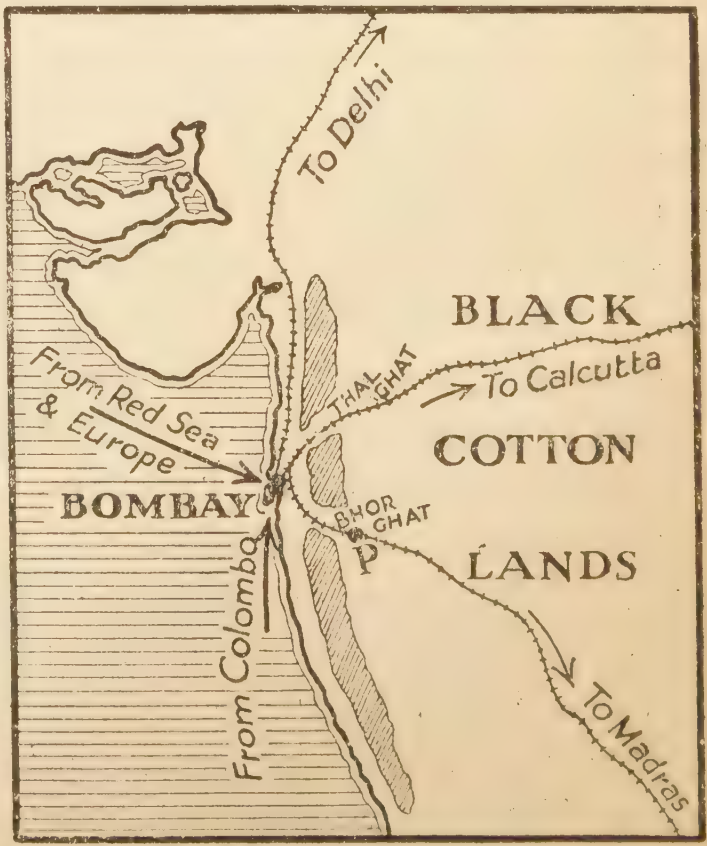

FIG. 46. POSITION OF BOMBAY

nected with its hinter-land (Fig. 46) by two branches of the Great Indian Peninsula Railway, one passing through the Thal Ghat, and the other through the Bhor Ghat. The former connects Bombay with Delhi and Calcutta, and the latter with Madras. A third line, the Bombay Baroda and Central India Railway runs northward along the coast.

Surat (117,434), near the mouth of the Tapti, was once the chief port on the west coast; but, owing to the silting of the river mouth, it has surrendered its trade to Bombay. It is still a large town with many cotton mills. *Ahmedabad* (274.000), on the Sabarmati, is a busy town with cotton mills. It is also an important railway centre with paper and leather manufactures. *Baroda*, the capital of the Baroda State, is also a great railway centre having cotton mills. The State of Baroda has many public libraries and gives much attention to education.

Poona (214,796,) the ancient Maharatta capital, stands on a high part of the table-land on the eastern side of the Ghats, commanding the Bhor Ghat. It is the hot-weather capital of the Bombay Presidency. *Sholapur*, *Dharwar*, *Hubli* and *Belgaum* in the south of the Bombay Deccan are collecting centres for cotton.

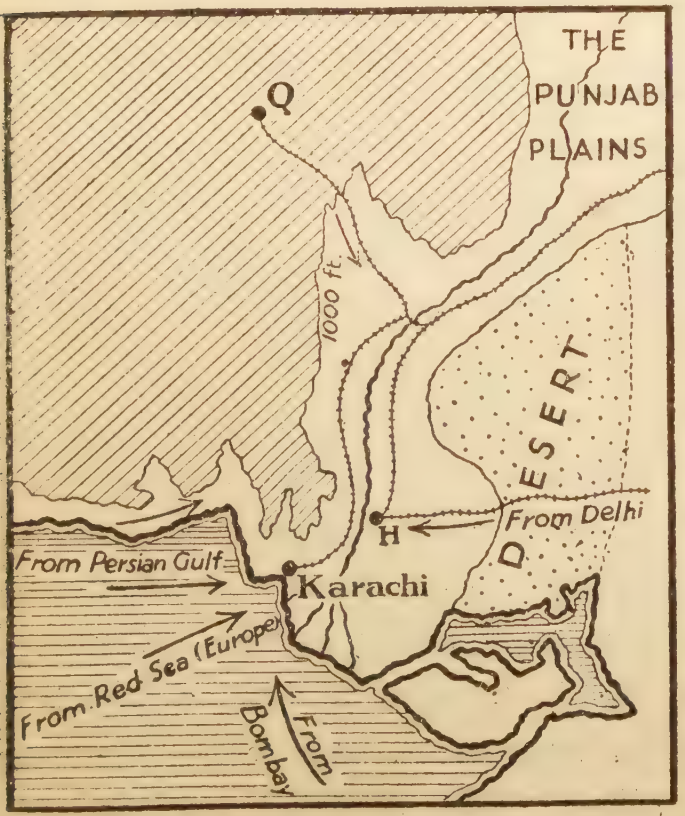

FIG. 47. THE POSITION OF KARACHI

Karachi (Fig. 47), the third port of India, (216,883), is the largest town in Sind. Its harbour has been improved by the construction of breakwaters so that it can be used by ocean steamers. It is the natural outlet of the Indus basin, and is connected by railways with the irrigated lands of the Punjab. Hence it exports the wheat and cotton grown there. It has also railway connection with Delhi. It is the nearest Indian port to Europe. It has acquired additional importance as a station on the Imperial Airways route. *Hyderabad*, at the head of the Indus delta, is another important town.

Near the southern end of the Presidency is the Portuguese territory of *Goa*. Its port, *Marmagoa*, is connected with the interior by a railway over the Ghats.

The settlement of *Aden* and its dependencies that were included in the Bombay Presidency have been formed into a Chief Commissionership from 1st April, 1932.

BURMA (Fig. 48)

Burma is the largest province of the Indian Empire, but it lies outside India proper from which it is shut off by mountain walls. Its people are of a different race and religion from those of India. There are no roads or railway across the mountains, so Burma can only be reached from India by sea.

Burma consists mainly of the great valleys of the *Irrawaddy*, the *Sittang* and the *Salwen* which are hemmed in on the east, north and west by high ranges. Hence all the river valleys open southwards to the Gulf of Martaban and the Indian Ocean. The Irrawaddy and its tributary, the Chindwin, which are both navigable are subject to floods during the south-west monsoon, and native houses in the plain are built on piles. The Sittang and Salwen are of little use for navigation. All the rivers of Burma are used for floating down rafts of timber from the forests of the mountains to the ports.

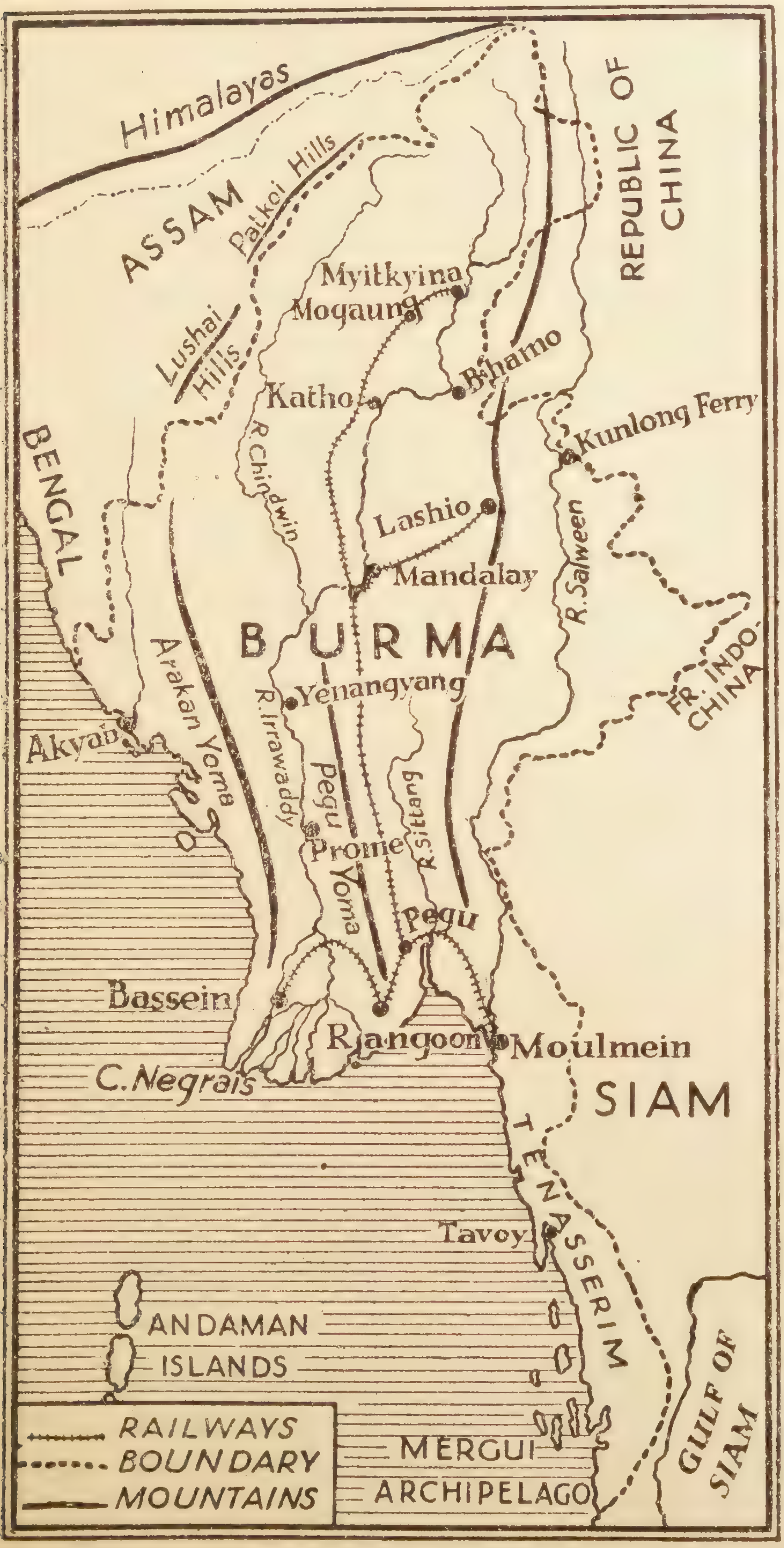

FIG. 48. BURMA

The coast strips receive the full force of the south-west monsoon, and, therefore, rainfall is very heavy there, but it is much less on the leeward side, especially round *Mandalay.* Temperatures are always high in the lowlands. The heat and heavy rainfall is well suited to the growth of *rice* which occupies two-thirds of the cultivated land in the province. It is cultivated in the flood plains and in the deltas of the rivers, and is largely exported. In the dry belt in the centre, *maize, millets* and *pulses* are grown. Tobacco is also largely grown as all Burmans smoke. The hills are covered with valuable forests from which teak is obtained.

The chief minerals found in Burma are : (1) *coal* in the Chindwin valley ; (2) *petroleum* in the Irrawaddy valley, especially near Yenangyaung from which it is taken by pipe-line to Rangoon ; (3) *rubies* at Mogok ; (4) *tin* and *wolfram* in Tavoy ; (5) *silver*, *lead* and *zinc* in Bawdwin (Shan States).

Although Burma is the largest Province in India, its population is only 14½ millions of whom 13 millions are Buddhists. Population is mainly confined to the rich deltas, the river valleys and the coastal plains. On hilly regions and plateaus live a few backward peoples.

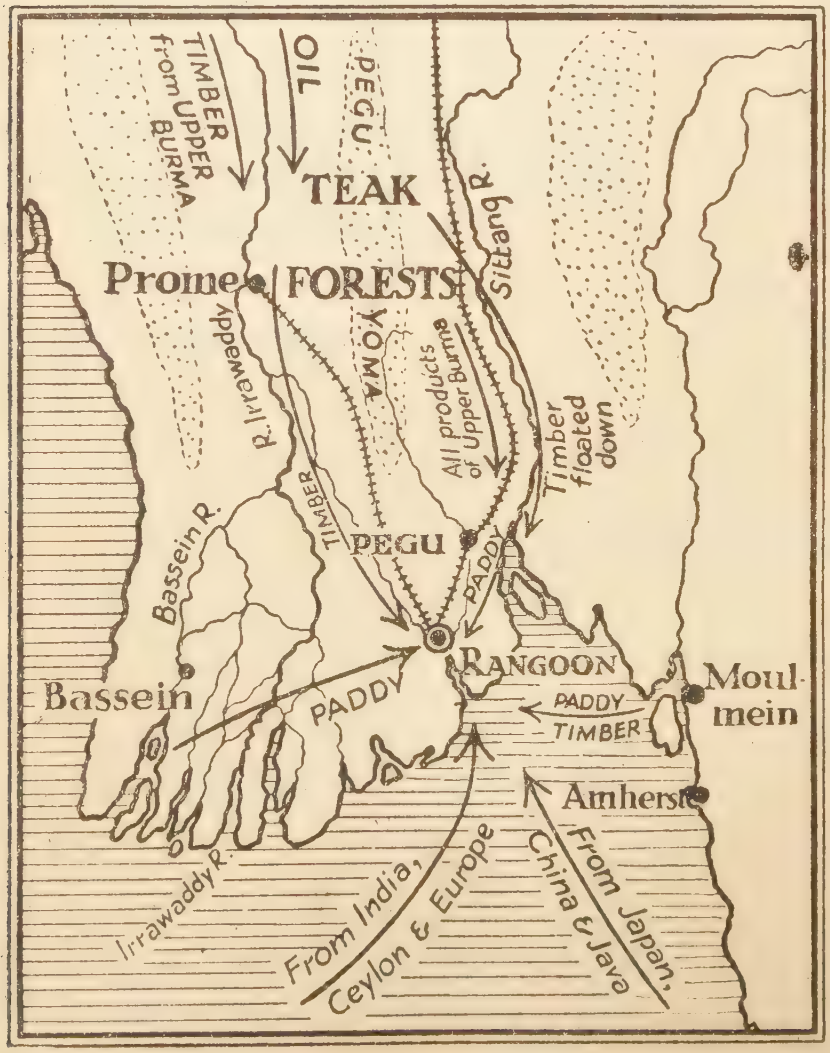

FIG. 49. POSITION OF RANGOON

Notice how it commands both the Irrawaddy and Sittang Valleys.

Towns : *Rangoon* (341,962), on the tidal estuary of the Rangoon River, a branch of the Irrawaddy, is the capital and the sea-outlet of the fertile delta and basin of the Irrawaddy. It has teak and timber yards, saw-mills, rice-mills and oil-refineries. Figure 49 shows the position of Rangoon and the various articles that are brought to its port. Other ports are *Bassein*, on the western delta arm exporting rice; *Akyab*, the port of Arakan exporting rice and teak; *Tavoy,* on the coast strip of Tenasserim, exporting tin; and *Moulmein*, at the Salwen mouth, trading mainly in teak and rice. *Mandalay*, the ancient capital, is a busy river port and railway centre.

Geographically belonging to Burma are the two island groups of the *Andamans* and the *Nicobars*. They form a separate British province administered by a Chief Commissioner. *Port Blair* is the capital.

Note: The North-West Frontier Province has been elevated to the position of a Governor's Province.

EXERCISES

(1) Draw a diagram to show the population of Calcutta, Bombay, Madras, Delhi, Hyderabad (Deccan), Allahabad, Lahore and Rangoon.

(2) Discuss the geographical importance of the sites of Delhi, Calcutta, Bombay and Rangoon. Draw sketches.

(3) Give a clear account of the natural resources of either the Indus or the Ganges basin.

(4) Locate the following towns giving the importance of each: Bikanir, Peshawar, Quetta, Agra, Patna, Cuttack, Cochin, Sholapur and Mandalay.

(5) In what natural regions can the Bombay or the Madras Presidency be divided? Give the climate and economic conditions of each region.

(6) Though Madras is the third city in India in respect of population, it is the fifth port. Why?

(7) Name the provinces which produce wheat, rice, sugar-cane spices, cotton, tea and timber on a large scale.

CHAPTER VI

OCCUPATIONS AND INDUSTRIES

The occupations of the people of India and Burma may fall under five heads: (1) rural industries connected with agriculture; (2) manufactures, chiefly in towns; (3) collection of forest produce; (4) mining and metal work; (5) fishing and the fisheries of chank, pearl, etc., as in the Gulf of Mannar. Figure 50 shows the distribution of population of India (1921) according to occupation. It shows that the chief industry of India is *agriculture.* More than two-thirds of the people get their living by cultivating the fields, pasturing cattle, sheep and goats, or by working in the forests. Hence India is a country of villages surrounded by fields. In the villages are blacksmiths, carpenters, weavers and potters making things needed by the people.

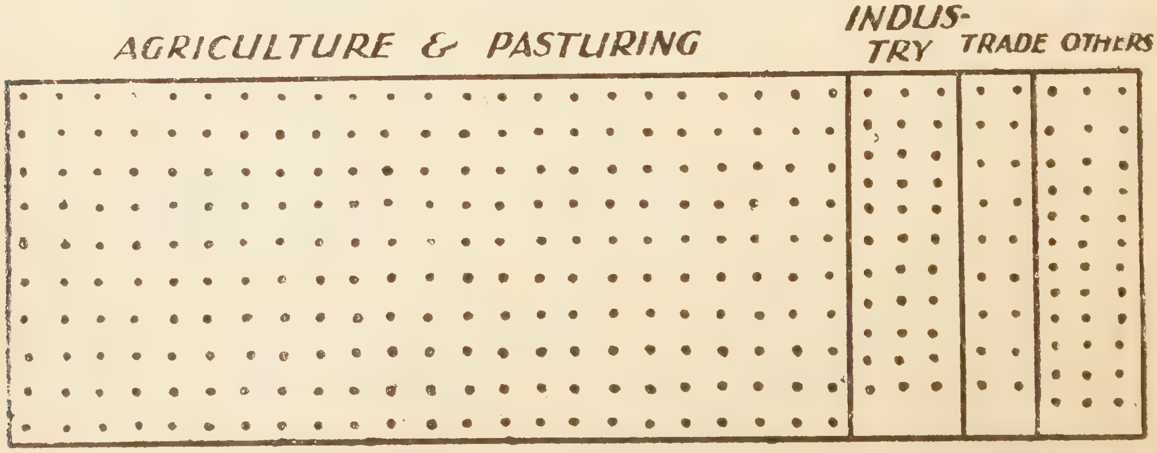

FIG. 50. DIAGRAM SHOWING THE DISTRIBUTION OF POPULATION ACCORDING TO OCCUPATION (1921).
Each dot represents one million people.

MANUFACTURES OF INDIA

(a) **Cotton goods.** The *spinning and weaving of cotion* has always been the most important industry next to agriculture, for every one in India wears cotton cloth. Formerly hand-made cotton goods were exported to Europe from India, but, now the Indians use cloths made in mills either in India, Britain or Japan. In many parts of India and Burma, every weaver family has its handlooms making coarse cloths or saris. The most important cotton manufacturing centre is Bombay. Why? There are also mills in the Madras Presidency and the Central Provinces and Berar. In every cotton-growing district *ginning* factories prepare the raw cotton to be sent to the spinning and weaving mills. Cotton cloths are also made at Benares, Chittagong, Dacca, Belgaum, Nasik, Cocanada, Bangalore, Salem, Tanjore and Madura.

(b) **Jute.** Calcutta is the centre of the Jute mills, most of which are located on the banks of the Hooghly. Jute is woven into coarse cloth and gunny bags which are mainly exported to Great Britain, U. S. A., and Australia.

(c) **Silk.** India has long been famons for its fine silks. Much of the raw silk is imported from China, but silk is also produced in India especially in Bengal. Silk goods are manufactured at Agra, Benares, Amritsar, Murshidabad, Ahmedabad, Surat, Poona, Karachi, Bangalore, Tanjore and Madura. *Tussore silk* is made in Bengal and Assam.

(d) **Woollen goods.** Sheep have good wool only in the colder parts of India, *i.e.*, among the Himalayas. Hence *carpets* and *shawls*, for which India has long been famous, are manufactured at Lahore, Amritsar and Srinagar. Cawnpore has woollen mills. Rugs or coarse blankets are made in many parts of northern India, and also at Cocanada and Nellore in Madras.

(e) **Paper.** Old rags, cotton and jute wastes, hemp and grasses are used in the manufacture of paper. There are paper mills at Calcutta, Bombay and Lucknow.

(f) **Dyeing.** Indian vegetable dyes such as indigo are now declining, owing to the cheap artificial dyes that are imported. Most of the cotton and silk weaving centres have dye works of their own.

(g) **Leather goods.** There is plenty of tanning materials, such as acacia pods and barks and myrabolams. Hence hides and skins are tanned into leather in most provinces, especially in Bengal and Madras. The Mafiras tanneries are the best in India. Mysore has a chrome-leather factory. Cawnpore is noted for its manufacture of many kinds of leather goods, such as boots, saddlery and other military equipments, and trunks.

(h) **Metal Works.** Ironwork is one of the ancient industries of India. The *steel* industry has developed in Bengal, Bihar and Orissa, and Mysore. The Tata Iron and Steel Works at Tatanagar (Jamshedpur) are the most important. At Budge-Budge, near Calcutta, there are factories which "turn out a lakh of tins every day" to be used by oil companies. The making of *copper* and *brass* vessels is an important industry in India. Why ? Madura, Tanjore, Benares, Baroda, Jaipur are some of the chief centres. Bangalore, Travancore, Madras, Trichinopoly, Tanjore, Bombay and Poona are centres of *silver* working. In recent years the making of *aluminium* vessels has begun in Madras.

(i) **Other Industries.** In Burma (Rangoon), in the Malabar Coast (Calicut), and in Assam, there are *saw-mills* where logs of teak and other timber are cut into planks. In the rice-growing districts of Bengal and Madras, and in Rangoon, there are *mills for husking and grinding rice.*

In the wheat-growing districts of the Punjab and the United Provinces there are *flour mills. Sugar* is made out of sugar-cane and jaggery. On the Malabar coast, *coir* and *mats* are made from the husk of the coconut and *oil* is squeezed out of the *copra. Tea factories* are found in Assam, Darjeeling and the Nilgris. Mangalore *cures coffee* before it is exported. Along the Malabar coast are many *tile factories* producing "Mangalore" tiles. *Pottery* is made all over India. At Rangoon there are *oil refineries* where oil is refined into petrol, petroleum and naphtha, out of which candles are made. *Ivory-carving* is an important handicraft at Delhi, Murshidabad, Mysore, Trivandram and Moulmein. India has always been famous for wood-carving. Toys, boxes, book-cases and ornamental works are made of teak, ebony and sandalwood.

The development of industries has led to the demand for power in factories. This has led to the development of *hydro-electric power* schemes. The Tata Hydro-Electric Works in Bombay have already been referred to. Many towns in the Punjab will get cheap power from the *Mandi* (on the Beas) hydro-electric scheme, and many in Madras from the *Pykhara* scheme.

EXERCISES

(1) Read from figure 49 the number of people that are engaged in agricultural and manufacturing occupations.

(2) What are the chief factory industries of India, and where are they carried on? Give reasons why the industries are carried on in those areas.

(3) The preparation of indigo dye is declining in India. Why?

(4) Name an industry associated with each of the following towns: Trivandram, Madura, Poona, Delhi, & Calicut.

CHAPTER VII

TRADE, TRANSPORT, SEAPORTS

TRADE

India is one of the oldest trading countries in the world. Thousands of years ago, Indian products were sent eastwards to China, and westwards to Mesopotamia and Egypt. At first the overland trade was carried on by caravans, but later on the sea became the great highway of trade. The sea trade of India began to increase, when the Europeans established trading stations in the country. Since the opening of the Suez Canal (1869) it has considerably increased. Now there is some overland trade between India and the trans-frontier countries, *viz.*, Persia, Afghanistan, Nepal, Tibet, Western China and Siam : but this is very small when compared with the seaborne trade.

India being mainly an agricultural country, her exports consist chiefly of raw products, and imports chiefly of manufactured articles. During recent years, Indian industries have, to some extent, developed, and the exports now include some manufactured articles also, *e.g.*, cotton and jute goods. Figure 51 shows the relative importance of the main exports and imports of India. The chief buyers of Indian merchandise are the British Isles, other countries of the British Empire, Japan, the United States of America, and Germany. Great Britain is the greatest buyer of Indian raw products, and the greatest seller of manufactured goods to India. The total trade of India in 1930-31 amounted to 559 crores of rupees, and of this the trade with Britain amounted to 172 crores.

DIRECTION OF TRADE: THE CHIEF EXPORTS

Jute. About half of the jute grown in Bengal is exported. Most of this is sent to Dundee (Scotland) and to Gremany. The other half is made into gunny bags which are sent to Britain, the United States, Argentina and Australia, where they are used for packing cotton, sugar, grain and wool.

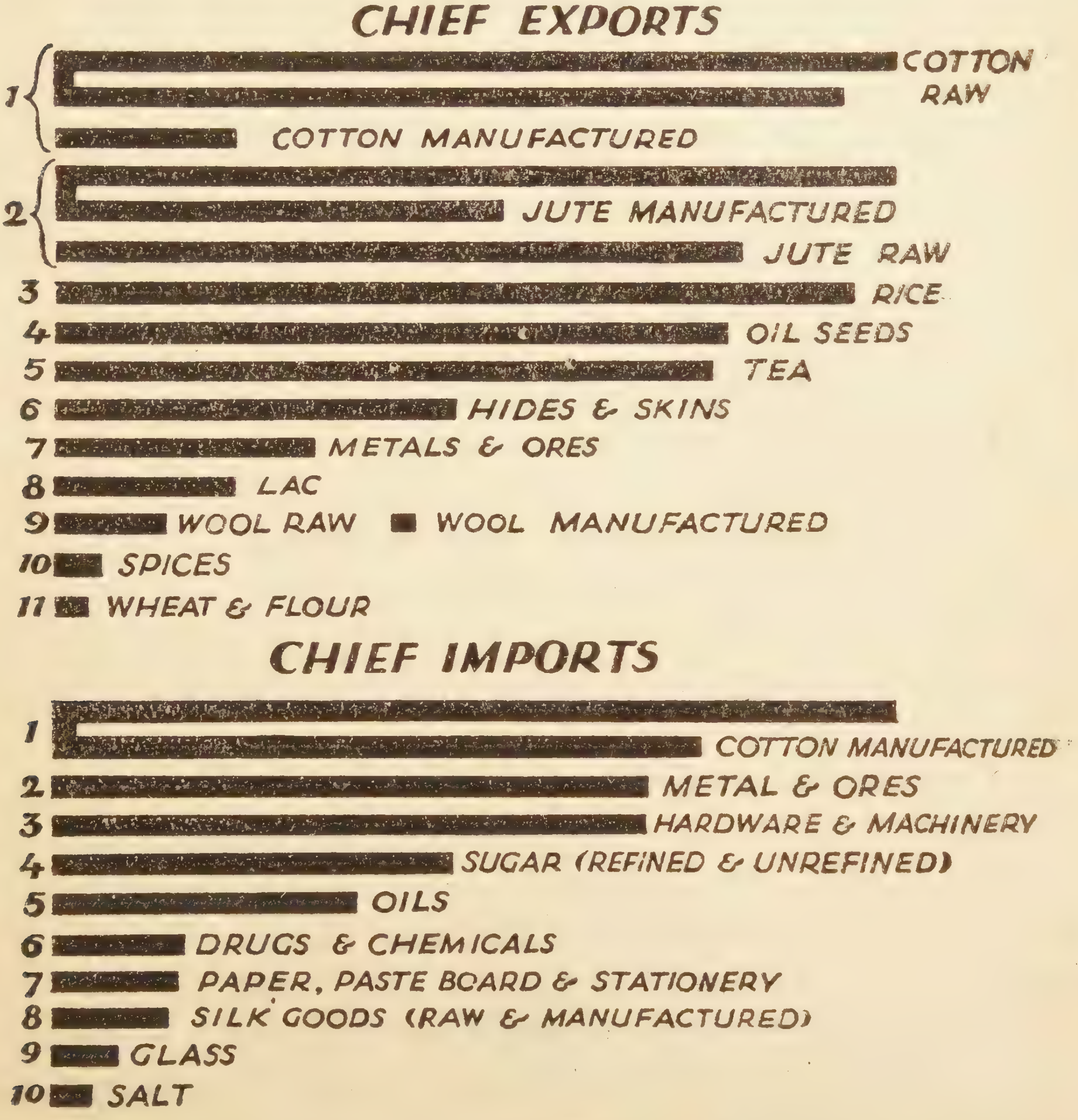

FIG. 51. DIAGRAM SHOWING THE RELATIVE IMPORTANCE OF THE CHIEF EXPORTS AND IMPORTS OF INDIA (1929—30.)

Cotton. *Raw cotton* is sent from Bombay and Madras to Britain, Japan, China and the continent of Europe. From Bombay large quantities of *cotton yarn* and *twist* are sent to Hong-kong, the Straits Settlements and Egypt; and *cotton piece-goods* to Mesopotamia, Persia, East Africa and Mauritius.

Rice from Burma and Bengal is sent mainly to Europe where it is used for making starch and for distilling. Large quantities are also sent to Ceylon, the Straits Settlements, Mauritius and Natal where there are many Indians. **Wheat** from the Punjab and the United Provinces is sent through Karachi and Bombay to England.

Oil-seeds are exported to Britain, France, Germany and other European countries.

Tea is largely consumed by all English-speaking people. Calcutta sends out the Assam tea, and Calicut that of the Western Ghats. Britain buys nearly 80 per cent. of the tea sent out of India. **Coffee** is exported from Mangalore to Britain and Australia.

Raw Hides and Skins are sent mainly to Germany and the United States. Tanned hides and skins and leather are mostly sent to England from Calcutta and Madras. Some *raw wool* is also exported to Britain. A large part of the *lac* produced in India is sent to the United States.

Timber goes chiefly to Britain. Teak and sandalwood are the most important. 90 per cent. of the timber is supplied by Burma.

Minerals: Most of the *manganese* of India is shipped to England from Calcutta and Bombay. *Mica* is sent from Bengal and Madras. *Coal* is shipped from Calcutta to Colombo, Penang, Singapore and Aden for the use of steamers. Tin, lead and wolfram are sent to England from Burma.

THE CHIEF IMPORTS

Cotton goods are by far the largest item of imports into India. Indian mills are not able to supply enough for the people. Large quantities of cotton yarn and twist and piece-goods come from the mills of Lancashire. In recent years Japan is having a large share in the cotton import trade. Of the *gray* goods imported into India in 1930-31 60 per cent. were supplied by Japan and only 39 per cent. by Great Britain.

Metals are imported into India in the shape of bars, beams, nails, screws, sheets, pipes, etc., from Great Britain. Belgium and Germany are also having a share in the trade. Large quantities of gold and silver are also imported through Bombay.

Hardware and Machinery are almost entirely from Great Britain. Germany and the United States also send a small proportion.

Railway plant. All railway materials and engines are mostly from Britain. Some of the engines, carriages and wagons are made in the railway work-shops in India; but the materials required for them come from England.

Sugar comes from Java and Mauritius.

Oil (kerosene) comes to India from the United States and Burma. Large quantities of **coal** are needed for the railways of India. The Bengal mines cannot supply it all; hence coal is imported from England and South Africa.

Silk and Woollen goods. Raw silk comes chiefly from China, and silk goods from Japan and China, and also from France and Britain. Woollen cloth comes from Britain and Germany. India, being a hot country, does not require much woollen cloth.

Glass. The lamps and chimneys used in the houses, and the bangles worn by women and children, used to come from Austria. Since the war, Japan has been sending them to our country.

Salt. A good deal of salt is imported from Britain, chiefly into Bengal; for Bengal has a dense population, and salt cannot be obtained from the sea near it on account of the heavy rainfall and the large number of rivers flowing into it.

Matches come from Japan, Norway and Sweden.

Besides the sea-borne trade described above, India has a considerable land trade. Cotton and leather goods, sugar and tea are sent to Afghanistan through the Khyber Pass; and fruits, raw wool and woollen goods are imported. Nepal takes cotton goods and salt, and sends to India grains, hides, and cattle. Persia buys cotton goods, tea and sugar and sends carpets and dates. Tibet exchanges its raw wool for cotton piece-goods.

There is also a considerable trade between India proper and Burma. India exports cotton goods and gunny bags to Burma, and imports from that country rice, teak, kerosene and petrol.

TRANSPORT

Rivers and Canals. The Indus, the Ganges, the Brahmaputra and the Irrawaddy, with their tributaries, are the chief means of inland navigation. The Indus is not easy to navigate as it often shifts its bed. The Ganges carries more boat traffic than any other river in the world except the Yangtse-kiang. The rivers of peninsular India are not so important for navigation as those of northern India. There is some boat traffic on the Mahanadi, Godavari, Krishna, Narbada and Tapti. The backwaters of Malabar, Cochin and Travancore, connected by canals, form an important water-route along the west coast. The most important canals of India are meant for irrigation purposes, but some are used for navigation. The *Great Ganges Canal* from Hardwar to Cawnpore is used both for irrigation and navigation. The canals of Bengal passing through the Sundarbans, those passing along the Orissa coast, and the *Buckingham Canal* in Madras, are navigation canals. The Buckingham Canal a salt water canal running close to the east coast, connects Madras with the canal system of the Krishna river in the north and also runs 60 miles south from Madras. It can be used only by flat-bottomed boats.

Roads. At present there are several roads in India connecting the principal towns. The most famous is the *Grand Trunk Road* running from Calcutta to Peshawar by way of Delhi and Ambala. This passes through the most thickly peopled region. There are three important roads from Madras. One goes to Calcutta, another to Calicut, and the third to the south. The roads are generally "metalled" and are maintained by the several District Boards. One drawback to the making of roads on alluvial plains is the difficulty of finding stones to metal the roads. All village roads are "unmetalled". There are several important hill roads. One is the Darjeeling Road ; another is the Ambala-Kalka-Simla road. Both these have now been replaced by railways. There is a road from Rawalpindi to Srinagar, and there are some good roads in the North-West Frontier Provinces by which troops can be easily taken to the frontier in times of trouble. Bullock carts are the chief means of transport on the roads. But now there is motor service in several places.

Railways (Fig. 52). By far the most important means of communication are the *railways.* They are most easily and cheaply made on flat lands ; hence the northern plains of India have a larger number of railways than the southern plateau. In Peninsular India the lines run mostly along the flat coast-strips. In the plateau parts, they run through gaps between hills and passes over the Ghats. Railways are valuable for several reasons:—(1) They provide cheap and swift means of communication in the most fertile and most densely populated parts of the country; (2) they connect the important seaports with the inland centres of trade, and transport large quantities of merchandise to and from the ports; (3) they can quickly

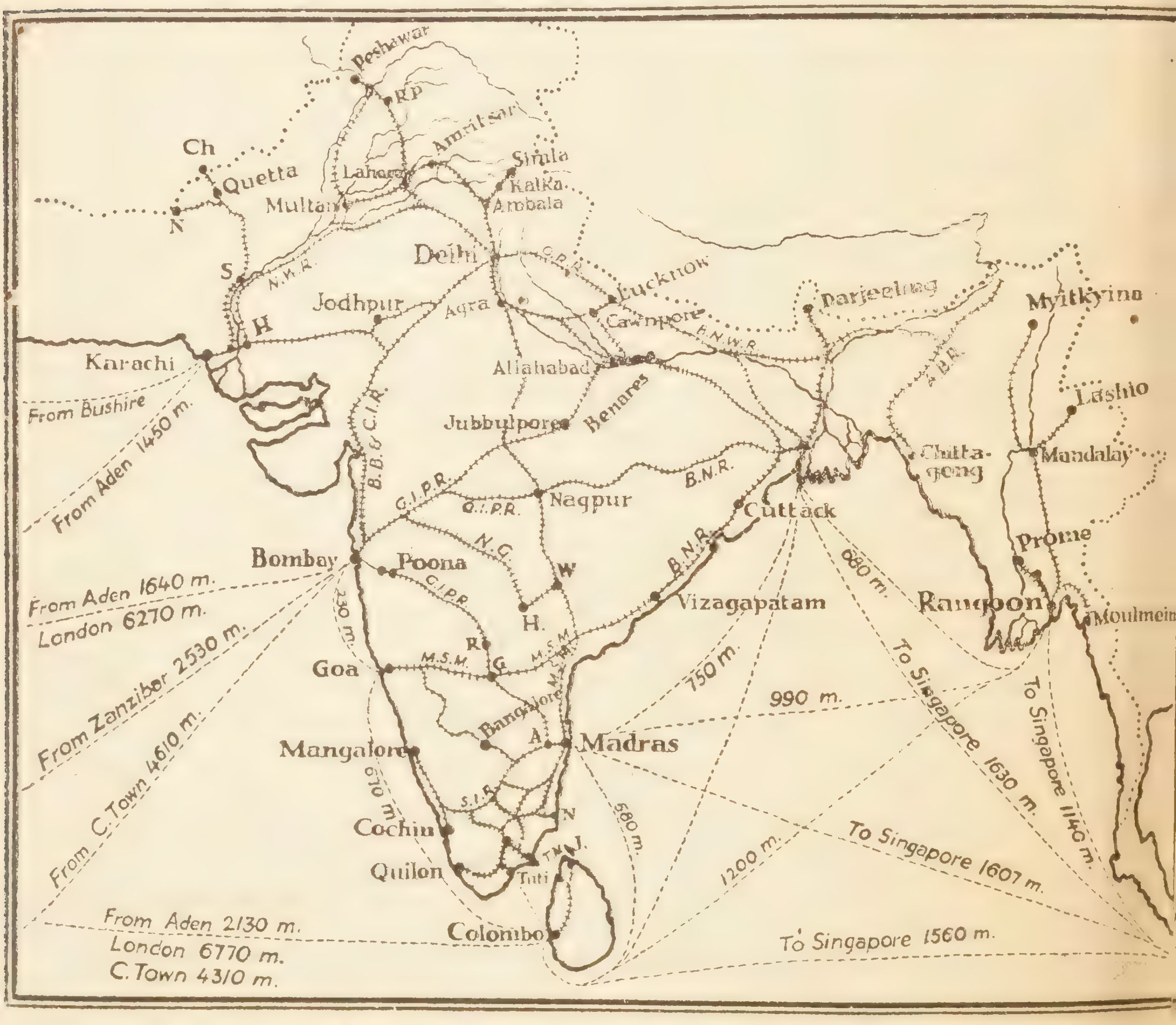

FIG. 52. INDIA : COMMUNICATIONS

convey food to regions that may be threatened with famine; (4) they can transport troops and guns quickly to any part of the frontier in times of trouble; (5) by means of railways letters and parcels are distributed by the Postal Department all over the country.

The following are some of the principal railways of India and Burma:—

(1) **The Assam-Bengal Railway,** connects Chittagong with the Assam valley. It is a metre gauge (3 ft. $3\frac{3}{8}$ ins.) railway passing through the fertile Surma valley across the hills to Gauhati on the Brahmaputra.

(2) **The Bengal and North-Western Railway** with its great net—work of metre gauge lines, serves northern Bihar and the eastern part of the United Provinces north of the Ganges. Gorakhpur and Darbhanga are important towns on the railway.

(3) **The Bengal - Nagpur Railway,** a broad gauge (5 ft. 6 ins.) line, runs from Howrah (Calcutta) to Nagpur which is connected with Bombay by the Great Indian Peninsular Railway. This is the shortest route between Bombay and Calcutta. A branch line runs to the Jherria coal-fields. A second main line of the Bengal-Nagpur Railway runs through Cuttack along the east coast as far as Vizagapatam. Here it is connected with the Madras and Southern Mahratta Railway coming from Madras.

(4) **The Bombay, Baroda and Central India Railway,** a broad gauge line, runs northward from Bombay along the coastal plain, and serves the districts after which it is named. This connects Bombay with Delhi and also with Agra and Cawnpore. The salt works of Rajputana are served by this railway.

(5) **The Eastern Bengal State Railway** is a broad gauge line south of the Ganges, but almost all the lines

north of the river are metre gauge. The River Ganges is crossed by a very fine bridge at Sara. It extends north-east and connects with the Assam-Bengal railway at Gauhati. It also connects with the hill railway running up to Darjeeling. The Dacca section, a part of the railway, is isolated as the river there is too broad to be bridged.

(6) **The East Indian Railway,** a broad gauge line, runs from Howrah through Patna, Benares, Allahabad, Cawnpore and Delhi to Ambala where it connects with the the North-Western Railway. From Allahabad the line runs to Jubbulpore where it connects with the Great Indian Peninsalar Railway from Bombay. From Ambala a line runs to Kalka from where the hill railway to Simla starts. The East Indian Railway also serves the Damodar Valley coalfields.

(7) **The Great Indian Peninsular Railway** runs north-eastwards from Bombay passing through the Thal Ghat in the Western Ghats to Jubbulpore in the Central Provinces where it connects with the East Indian Railway from Allahabad. A branch from this runs eastward to Nagpur where it joins the Bengal-Nagpur. A third line runs south-eastwards from Bombay through the Bhor Ghat in the Western Ghats to Raichur where it joins the Madras and Southern Mahratta Railway. The Great Indian Peninsular mail route from Bombay to Delhi runs through Itarsi, Bhopal, Jhansi, Agra and Muttra. All these are broad gauge lines.

(8) **The Madras and Southern Mahratta Railway.** There are three principal lines from Madras. One runs northwards and then north-eastwards along the coast as far as Waltair (near Vizagapatam) where it joins the Bengal-Nagpur Railway. The second main line runs north-westwards to Raichur and joins the Great Indian Peninsular

Railway. The third main line runs south-westwards to Jalarpet where it joins the broad gauge section of the South Indian Railway. These main lines are broad gauge. A section of the Madras and Southern Mahratta Railway runs right across the peninsula from Bezwada to the port of Goa on the west coast.

(9) **The North-Western Railway** serves the whole of north-west India. Most of the lines are broad gauge. This railway connects Lahore and Peshawar with Delhi on the east and with Karachi, on the south. About a thousand miles of this system have been built for strategic purposes. From Peshawar the line runs westwards through the Khyber pass to Landi Khana on the Afghan frontier. From Sukkur on the Indus a branch line runs to Sibi which is connected with Quetta by two lines—one by the Bolan Pass and the other by the Harnai Pass. The line has been carried beyond Quetta in the direction of Kandahar, but stops at Chaman near the Afghan frontier. A branch from the Bolan Pass line runs westwards up the plateau as far as Duzdap, near the western frontier. From Hyderabad (Sind) a branch runs right across the Great Desert to the main line of the Bombay Baroda and Central India Railway. This line across the desert connects Karachi with Delhi and also with Bombay.

(10) **The Oudh and Rohilkhand Railway** (mostly broad gauge) runs through Oudh and Rohilkhand as far as Saharanpur, where it connects with the North-West Railway. Branches of this railway meet the East Indian Railway at Benares, Allahabad and at Cawnpore.

(11) **The South Indian Railway** serves the whole of South India south of Madras city. The main line (metre gauge) runs south to Trichinopoly and Madura,

and thence south-east to Dhanushkodi on the island of Rameswaram. Here the line is connected by a ferry with Talaimannar on the island of Mannar, the terminus of the Ceylon Government Railway. This is the route followed by the mails from Madras to Ceylon. The distance has now been shortened by a chord line from Trichinopoly to Manamadura. A branch line runs from Madura to Tinnevelly and Quilon from where the line runs to Trivandram. From Manyachi on the Madura-Tinnevelly section a branch runs to Tuticorin which has a steam-boat service to Colombo. The broad gauge section of the S. I. R. runs south-westwards from Jalarpet, and then westwards through the Palghat Gap to the west-coast, where it runs northward as far as Mangalore. There is a branch to Cochin. From Mettupalayam on the broad gauge main line a branch runs up the Nilgris to Ootacamund.

(12) **The Burma Railways** are metre gauge. The main line from Rangoon runs up the Sittang valley to Mandalay, and then up the upper Irrawaddy valley to Myitkyina. From Mandalay a branch line runs north-east to Lashio and will ultimately reach Kunlon Ferry on the Salwen which is the meeting place of the trade between Burma and West China. Another line from Rangoon runs to Prome on the Irrawaddy, with a branch across the delta to Bassein.

The **Grand Trunk Express** runs from Madras to Delhi *via* Bezwada, Warrangal, Chanda, Wardha, Nagpur, Itarsi, Bhopal, Jhansi and Agra.

The chief Indian State Railways are the Nizam's, and the Mysore and the Jodhpur-Bikaner Railways.

Sea Routes (Fig. 52 and 53): India has a good sea position, being well situated for trade with lands around the Indian Ocean. (*Vide* Chapter VI, **Africa.**) There is a large sea—trade along the coasts of India and Burma.

Goods are collected from the smaller ports and are taken to the large seaports by small steamers. The coasting trade is a busy one along the Madras coast where there are several small ports. Bombay ships her cotton goods to the ports on the west-coast, and also to Karachi and the Persian Gulf. Calcutta sends coal to Madras, Rangoon and Colombo, and gunny bags to all the ports. There is a regular trade between Rangoon and the chief ports of India, and between Tuticorin and Colombo.

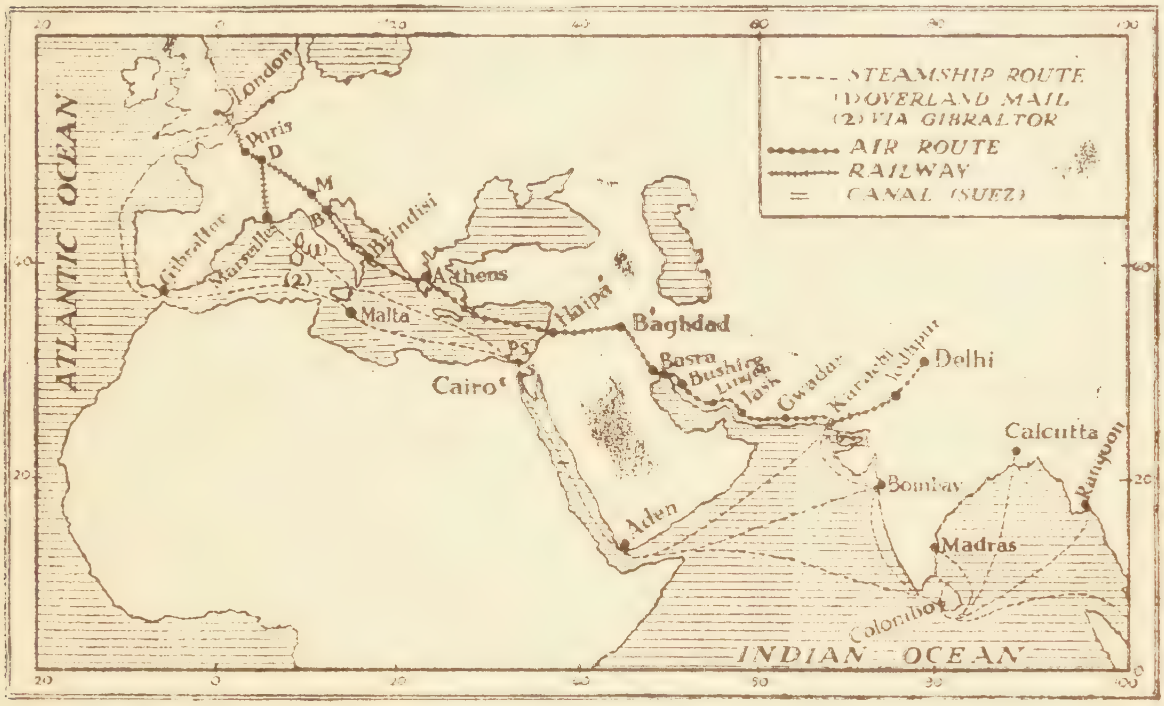

FIG. 53. STEAMSHIP AND AIR-MAIL ROUTES BETWEEN INDIA AND ENGLAND (1931-32)

Air Route: There is a regular air-mail service between London and Karachi. Fig. 53 shows the chief towns on the route. This air-mail service is extended from Karachi to Delhi. There will be a trans-India air-mail service between Hyderabad (Sind) and Mirzapur. From Karachi to Hyderabad and from Mirzapur to Calcutta the mails will be carried by train. An agreement has been recently signed between the Government of India and

Messrs Tata and Sons Ltd., for the operation of the Weekly Air Mail Service between Karachi and Madras connecting with the Imperial Air-ways Service between Karachi and Europe.

PORTS

Ports are gateways of commerce. They must have good harbours protected from the open sea. The best place for a port is the mouth of a wide river, such as the Hooghly on which Calcutta stands, or an inlet on the coast, such as that on which Karachi stands, or an arm of the sea protected by an island, as in the case of Bombay. In a river mouth the flowing tide assists shipping, but the river has the disadvantage of silting up. Hence the Hooghly has to be kept deep by constant dredging. Sometimes harbours are *built* as in the case of Madras.

The prosperity of a port depends not only on the safety of its harbour, but also on its *hinterland.* The hinterland should be rich, producing things for export, and should have a dense population requiring articles from other countries. Again there should be good means of communication between the port and its hinterland where exports can be easily collected and imports easily distributed.

The chief ports of India and Burma are (1) Calcutta, (2) Bombay, (3) Karachi, (4) Rangoon and (5) Madras. The importance of the position of these ports and the nature of their hinterland have already been dealt with. (Chapter V.) Fig. 54 gives you an idea of the relative

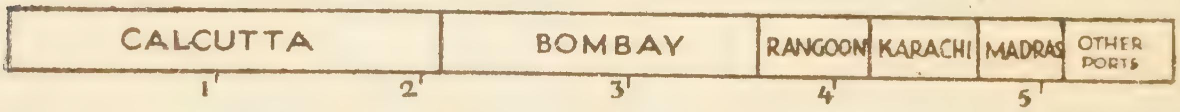

FIG. 54. TRADE (EXPORTS & IMPORTS) OF THE WHOLE OF INDIA AND THE PRINCIPAL PORTS (1929 30)
(Each division represents 100 crores.)

importance of these ports. Of these, Calcutta and Bombay are of outstanding importance. Nearly 75 per cent of the foreign trade of India passes through these ports.

Calcutta has for its hinterland the whole of the Ganges valley and nearly all the north-eastern portion of India. It exports jute (raw and manufactured), tea, lac, oil-seeds, hides and skins, rice, indigo, and opium, and imports cotton goods, iron and steel, machinery, railway stock, sugar and oil. Jute forms three-fifths of the exports.

Bombay has the rich black cotton area for its hinterland. The chief exports are cotton (raw and manufactured), cotton and other oil seeds, and hides, skins and leather. Cotton and cotton goods form three-fourths of the exports. The imports are cotton goods from Lancashire and Japan, machinery, sugar, silk goods, railway engines, motors, oils from U. S. A., dyes and chemicals from Germany. A large quantity of gold and silver is imported from Australia and the United States.

Karachi, Rangoon and Madras come next in importance,

Karachi: The whole of the Punjab and Sind forms the hinterland of this port. Its exports are raw cotton, wheat, barley, oil-seeds, wool, hides and skins. The imports are like those of Bombay and Calcutta. Oil is brought from Persia.

Madras: As Madras has to compete against a large number of ports, its trade is much less than that of the other important ports. The most important exports are leather, skins and hides, raw cotton and cotton goods and groundnuts. Groundnuts are sent to France. The imports are just like those of Calcutta or Bombay. Leather and skins form three-fourths of the exports.

Rangoon is the chief port of Burma through which passes nearly 85 per cent of the total trade. By far the most important export is rice (nearly 63 per cent of the total.) Next come petroleum and wax, and then teak. The imports are similar to those of India.

Besides the ports mentioned, there are others whose harbours are suitable only for small ships., *e.g.*, Surat, Goa, Mangalore, Calicut, Cochin, Tuticorin, Nagapatam, Vizagapatam, Chittagong, Akyab and Moulmein.

EXERCISES

(1) To which countries is each of the following products sent: wheat, jute, tea, cotton, oil-seeds, lac and teak? Name the ports from which the commodities are sent.

(2) What manufactured articles are exported from India? To which countries are they sent?

(3) From which country or countries does India import her machinery, oil, sugar, silks and dyes?

(4) Draw a sketch map showing the chief routes from Bombay to other cities in India, Name the railways on each route and explain how the direction of the railways is dependent on the surface relief.

(5) Which part of India has a network of railways? Why?

(5) A man travelling from Peshawar to Madras wants to visit Delhi and Bombay on the way; name the chief towns on the way, and the railways on which he would travel.

(7) What factors contribute to the prosperity of a port? Illustrate your answer with reference to Calcutta and Bombay.

(8) From figure 51, write down the approximate values of the chief exports and imports of India.

CHAPTER VIII

CEYLON (Fig. 55)

Position: Ceylon, a pear-shaped island to the south-east of India, is separated from the mainland by Palk Strait and the Gulf of Mannar. It must once have formed part of India, for the two are very nearly joined by a low ridge of coral and sandstone (22 miles long), known as *Adam's Bridge*.

Ceylon consists of a central mass of *mountains* surrounded by a broad *coastal plain*. The highest part of the mountains lies somewhat south of the centre of the island and reaches a height of 8,000 feet. The mountain region has been dissected by rivers which flow in all directions. The longest river is the *Muhaweli Ganga*. The northern half of the island is comparatively low. The west-coast of the island has sand dunes and lagoons as the west coast of India. The coast-line is irregular, but there are only a few natural harbours, as at Trincomalee and Galle. Colombo has only an artificial harbour. (Fig. 56)

Climate: Ceylon is very near the equator and is therefore hot throughout the year, the January temperature of Colombo being 79 °F. Being an island, Ceylon has an equable climate, the range of temperature at Colombo being only 3° F. The island lies in the path of both the monsoons, so that it has a heavy rainfall on the west and south-west coasts and on the western slopes of the mountains during the south-west monsoon (May—September) and a heavy rainfall on the north-east coasts and the eastern slopes of the mountains during the north-east monsoon

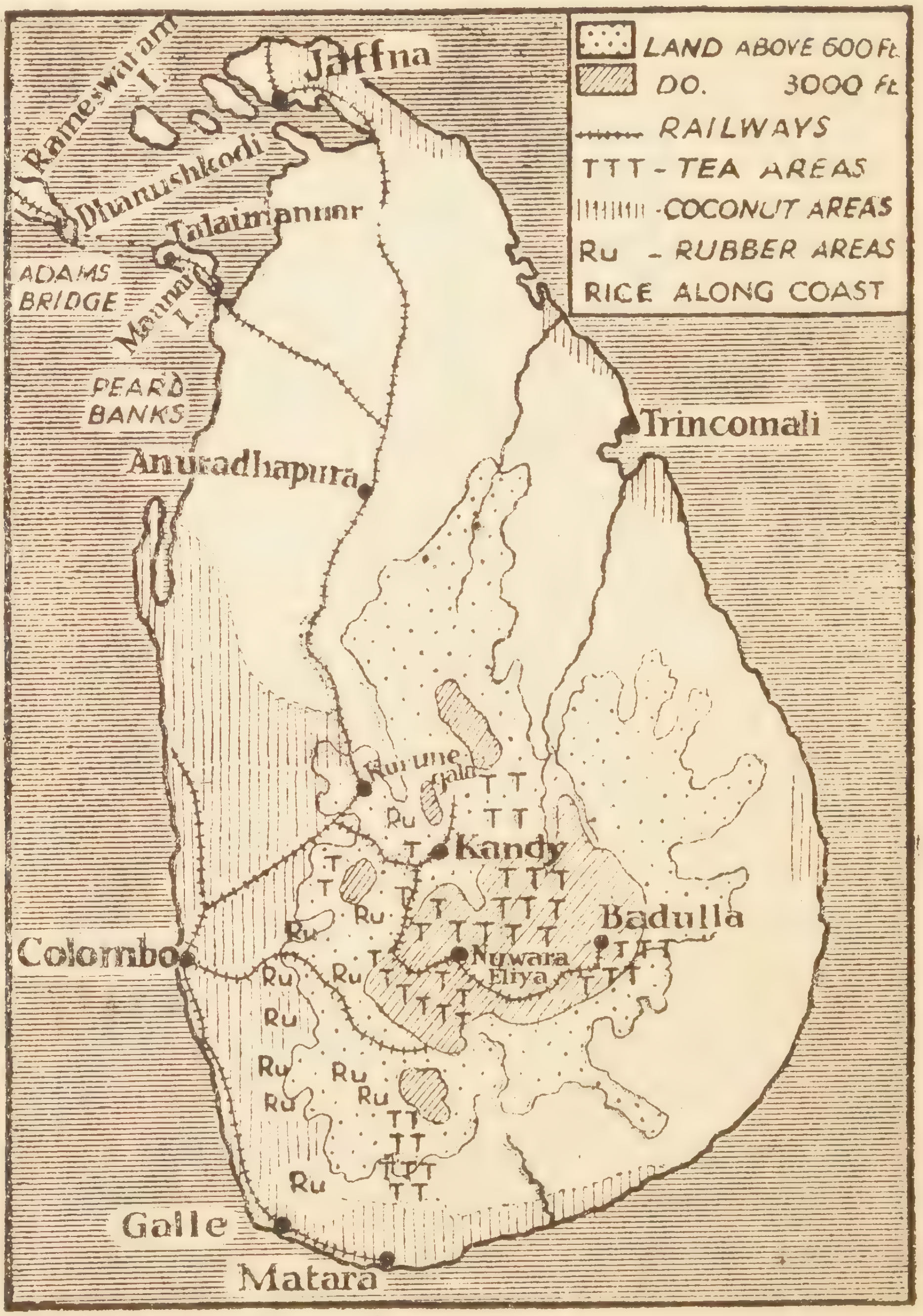

FIG. 55. CEYLON

(November - February). Compare the mean monthly rainfall (in inches) of Colombo and Trincomalee.

Account for the difference you note. Notice the double maximum rainfall of Colombo. What is that due to ?

	J	F	M	A	M	J	J	A	S	O	N	D	Year
Colombo	3·2	1·9	4·7	11·4	12·1	8·4	4·5	3·8	5·0	14·4	12·5	6·4	88·3
Trincomalee	5·7	2·2	1·4	2·1	2·4	1·4	2·1	4.5	4 2	8·0	13·6	15·3	62·9

There are comparatively dry areas in the north, north-west and south-east. The ruins of ancient cities, like *Anuradhapura*, and the old irrigation works in the north, testify to the former existence there of a dense population.

Vegetation: Along the coast, there are *coconut* palms which thrive well on the saline sandy soil. In the interior low lands *rice* is cultivated, watered by the streams coming from the mountains. The west slopes of the mountains were once covered with evergreen tropical forests which have now been cleared to make room for rubber plantations and tea gardens. *Tea* covers some 400,000 acres, especially in the region of *Kandy*, *Nuwara Eliya* and *Badulla*. Over 60 per cent of the yield goes to Britain. The bulk of the *rubber* produced in the island goes to the United States. The chief exports of Ceylon are tea, rubber, coconuts, coconut oil, and copra. Other important products are *cocoa*, *cinnamon* and *areca nuts*. Rice grown in the island is not enough to feed the whole population, hence a large quantity of it is imported from Burma. Cotton goods, coal and sugar are other imports. In the low northern region the palmyra palm flourishes.

People: The population of Ceylon is about 4½ millions. It is dense in the south-west. The Sinhalese who form the bulk of the population are Buddhists. The north of the island is inhabited by the Tamils who are mostly Hindus. They came first as conquerors, but in recent times, they have come as labourers to work in the plantations. 60 per cent. of the people are Buddhists, and 22 per cent. Hindus; the rest are chiefly Christians and Muhammadans. The descendants of the old Portuguese and Dutch settlers are known as Burghers. The earlier inhabitants are now represented by a few Veddas who live in the wilder parts of the mountains. *Agriculture* on the plains and *fishing* along the coast are the chief occupations of the people. In the mountains they work on the plantations or in the forests. A little *plumbago* is mined, and some precious stones are also found

Towns: *Colombo*, the largest town on the west coast, has a fine harbour formed by long break-waters (Fig 56). It is the halfway house of the Indian Ocean (Fig. 57) and the meeting place of ocean routes from Europe, Africa, the Far East and Australia. It is an important coaling station, and carries on a large amount of 'transhipment' trade in addition to its regular

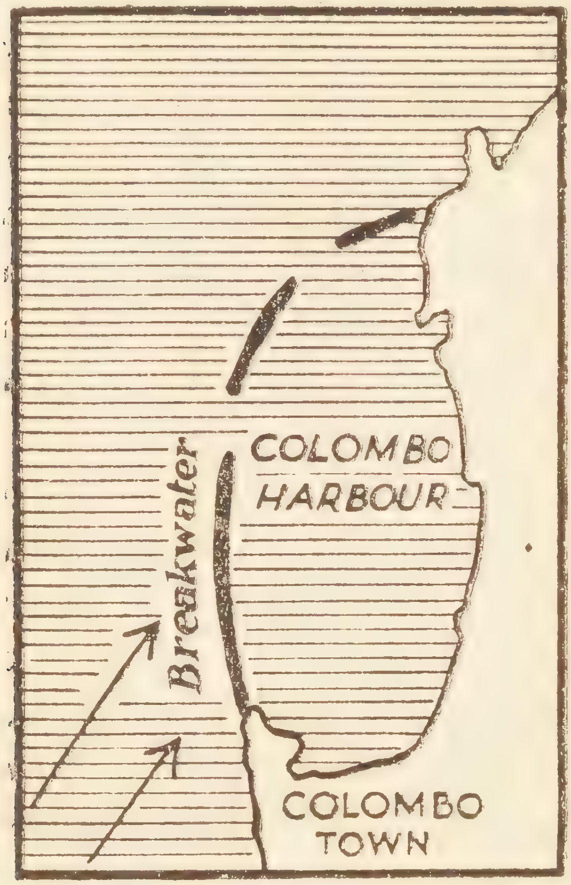

Fig. 56. Colombo Harbour

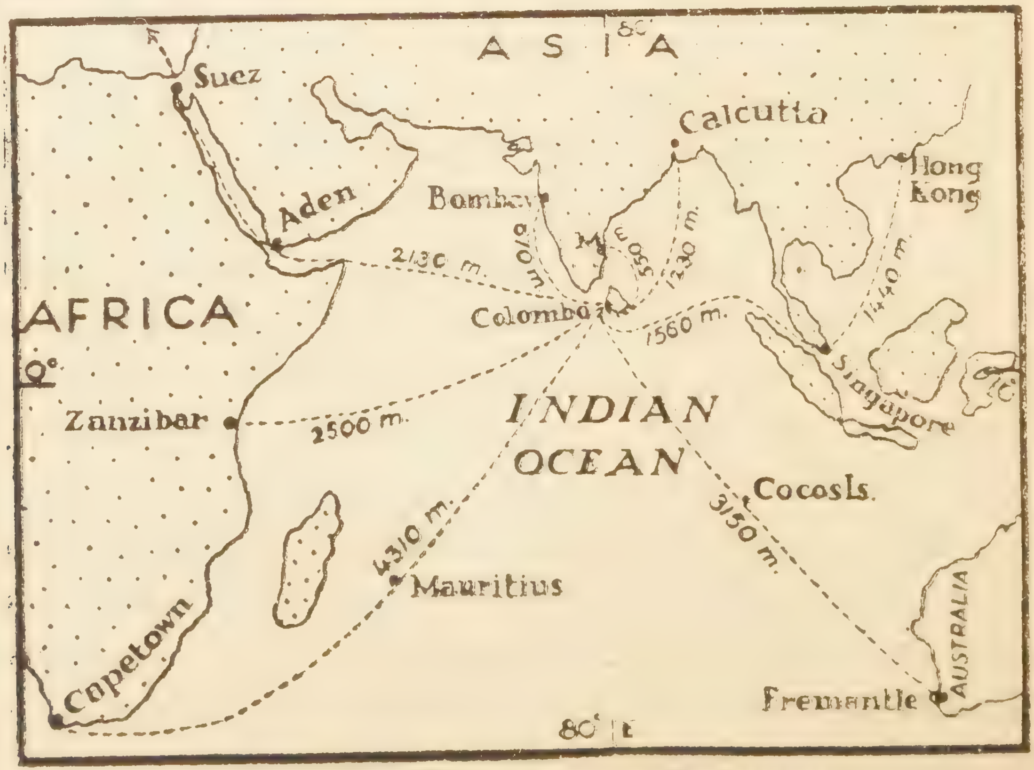

Fig. 57. Position of Colombo

trade. It is the centre of the Ceylon Government Railway. One line runs southward to *Galle*, and another northward to *Jaffna* with a branch to *Talaimannar*, where it is connected with the S. I. R. at Dhanushkodi by a ferry system.

Before the harbour of Colombo was finished, *Galle* used to be the port of call. *Trincomalee* in the north-east, has a large natural harbour; but it is not important as it lies off the track of ocean routes. *Kandy*, the old capital containing the famous "Temple of the Tooth," and *Nuwara Eliya*, a well-known hill-station, are connected by a railway line with Colombo.

In matters of Government, Ceylon is entirely separated from India. The *Maldives*, a group of coral islands to the south-west of Ceylon, are a dependency of Ceylon. The people here are Muhammadans and are ruled by a Sultan. Fishing is an important occupation. Coconuts are the chief products, and a very fine quality of coir is exported.

EXERCISES

(1) Draw a diagram to represent the mean monthly rainfall of Colombo and Trincomalee.

(2) Explain the importance of Colombo as a focus of routes in the Indian Ocean.

(3) Draw an outline of Ceylon and mark in it the areas devoted to the production of coconuts, rubber and tea.

(4) Why is the northern portion of Ceylon comparatively dry ?

THE WORLD

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THE WORLD

CHAPTER I

STUDIES IN CLIMATE

SHAPE AND SIZE OF THE EARTH, ROTATION AND REVOLUTION

TILL now you have been studying the continents and their regions. It was shown that climate was an important factor in determining the nature of the regions and the life and work of the peoples living there. It was also shown that certain regions in the continents had some broad similarities owing to similarity of position and climate. These climatic conditions can be shown to be "parts of one great arrangement extending over the whole world", and they depend upon how the earth obtains heat and light from the sun. This again is determined by the movements of the earth in relation to the sun.

The Shape and Size of the Earth.—For long ages, the surface of the earth was thought to be flat; but now we know that the earth is a ball in shape, almost exactly a sphere but very slightly flattened at the poles. This flattening is so slight that the polar diameter is only 26 miles less than the equatorial diameter (Fig. 1). The diameter of the earth is nearly 8,000 miles so that its circumference is nearly 25,000 miles.

There are a number of reasons for believing that the earth is a sphere:—(1) Ships sail round it. A ship starting from any of the ports of India, can sail westwards across the Arabian Sea and pass through the Suez Canal into the Mediterranean Sea and right across the Atlantic ocean to the Panama Canal. After passing through this canal, it can cross the Pacific to China and thence come back to India *via* Singapore. If there were no lands to interfere it would be possible for the ship to sail round the world on any parallel of latitude.

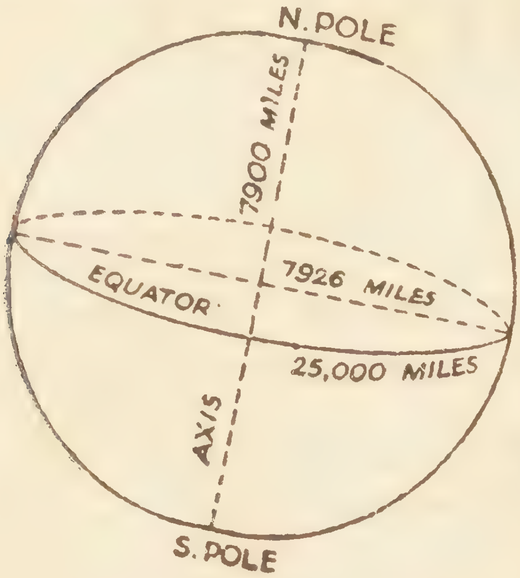


FIG. 1.

(2) The Earth's shadow, in eclipses of the moon, is round. The only body that casts a circular shadow *in all positions* is a sphere.

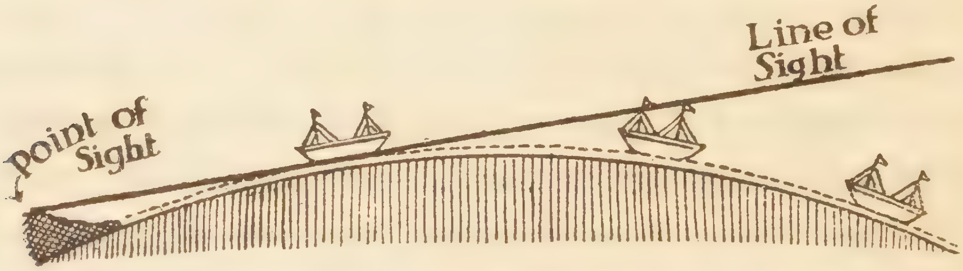


FIG. 2. Diagram showing curvature of the surface of the sea.

(3) If you observe with a telescope, a distant ship coming into view, you see first of all the masts, then the funnel and lastly the hull. Similarly if the ship is moving away from you it is the hull that first disappears from your view. This is due to the curvature of the surface of the sea. (Fig. 2).

(4) The horizon is always circular. This is found only on a sphere. As a balloonist rises in the air the circular horizon increases steadily. This could not happen if the earth were flat. (Fig. 3).

(5) The sun rises earlier for places in the east than it does for places in the west. If the earth's surface were flat, all places on it would have sunrise, noon, and sunset at the same time.

(6) The sun and moon and the other planets are spheres.

The total surface of the earth is 197,000,000 square miles. More than two-thirds of this is water. The size of the earth is great as compared with human beings, but small as compared with the sun whose diameter is more than 100 times as great.

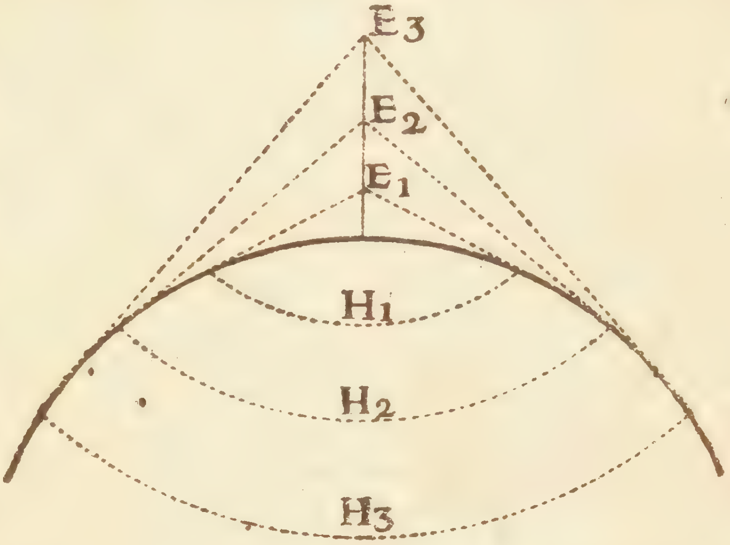
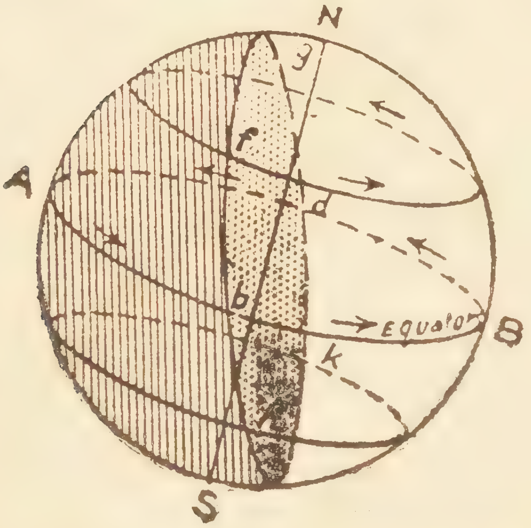


FIG. 3. Diagram showing increase of horizon with the incrase of elevation **E.** Elevation; **H.** Horizon.

Movements of the Earth—Day and Night and the Seasons.—The earth has two movements : it turns round on its own axis once every day, and moves round the sun once every year.

The Rotation of the Earth on its Axis.—Sometimes when you are in a railway train starting from a station, the buildings and the lamp posts seem to be moving in the opposite direction. In the same way we see the sun pass across the sky and think it goes round the earth, when really the earth itself is turning round. The sun *appears* to move from east to west, really it is the earth that rotates on its axis from west to east,

The school globe has a rod going through the middle upon which it rotates ; this rod we call the *axis*, and its ends we call the *poles.* The earth has no rod passing through it, so the axis (Fig. 1) of the earth is only an imaginaay line joining the poles through the centre of the earth.



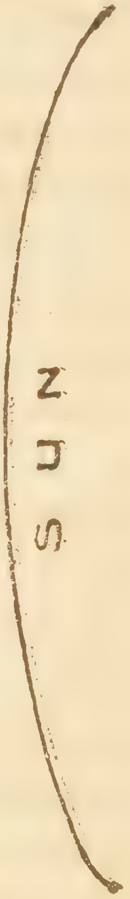


FIG. 4-a. Day and Night

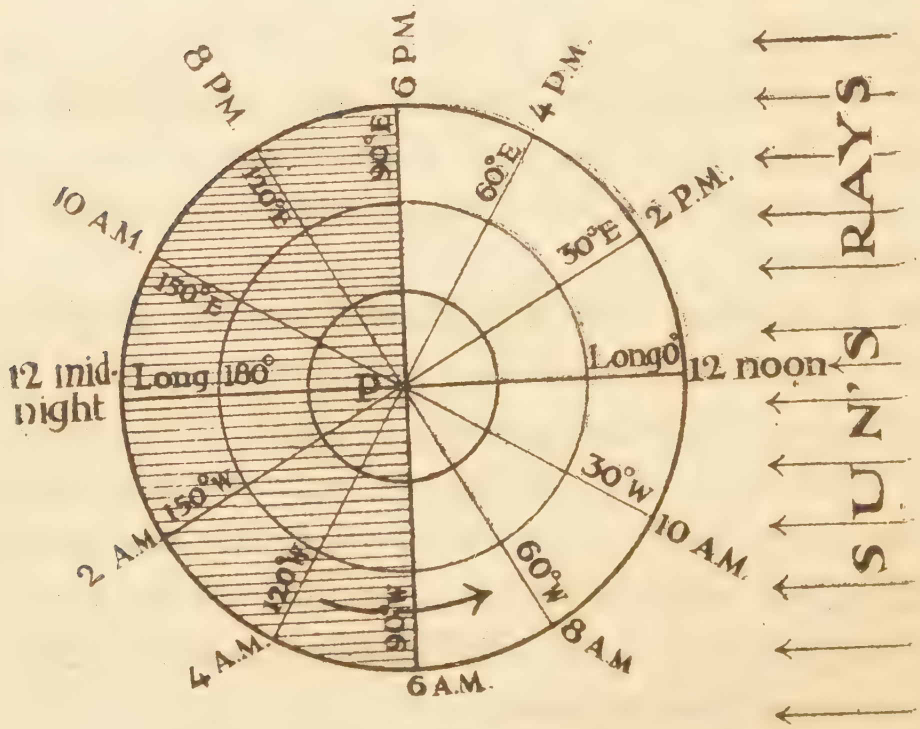


FIG. 4-b. Longitude and Time

Day and Night.—The rotation of the earth causes day and night. Only one half of the earth is turned to the sun at one time, and the other half is turned away from it. (Fig. 4-a). The half facing the sun is in light and is said to have *day*, while the other half is in darkness and is said to have *night*. A complete rotation takes 24 hours. As the earth is always rotating every place has day and night alternately. When a place leaves darkness and enters light, it is said to have sunrise. When it comes exactly opposite the sun, it has noon. When it leaves light and enters darkness it has sunset. Halfway between sunset and sunrise it has midnight. (Fig. 4-b.)

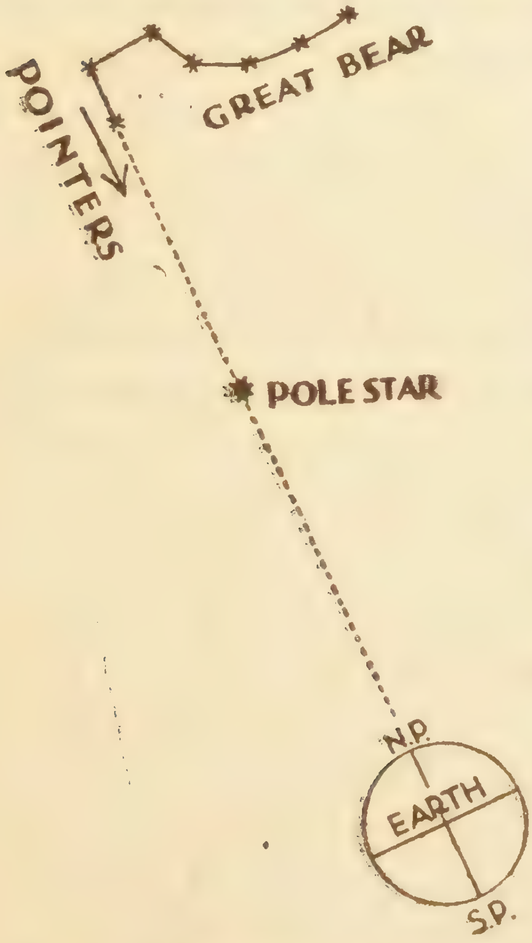


Fig. 5. Diagram showing Earth, Pole Star & the Great Bear. (The position of the Pole Star is fixed.) In whatever position the Great Bear may be, line joining the pointers, if produced, will meet the Pole Star.

The Poles.—We have said that the two ends of the earth's axis are called *Poles*. One is the North Pole and the other is the South Pole. The North Pole is always pointing to a certain star in the sky, called the *Pole Star*. The direction of this star is north. The Pole Star can be recognised with the help of the Great Bear constellation. (Fig. 5).

Latitude.—Examine a school globe; you see a number of lines drawn round it passing east and west and north and south. Similarly we can imagine that the surface of the earth is cut up by such lines. The line supposed to be drawn round the earth midway between the Poles is the *Equator*. It divides the earth into two hemispheres, the Northern and Southern.

The distance of any place north or south from the equator is its *latitude*. This distance may be measured either in miles or degrees; but it is generally measured in degrees. The equator measures 360°; the distance from the N. Pole to the S. P. is 180° and that from the equator to either pole is 90°. 1 degree is subdivided into 60 minutes (60′) and 1 minute into 60 seconds (60″). Madras is 13° 4′ north of the equator and so its latitude is said to be 13° 4′ N.

On the globe at every 10° north and south of the Equator, lines are drawn parallel to the Equator. These lines are called *Parallels of Latitude*. (Fig. 6). We can draw parallels for each degree of latitude. All the parallels are full circles; the Equator is the greatest of the parallels and the other parallels decrease in circumference as they approach the poles.

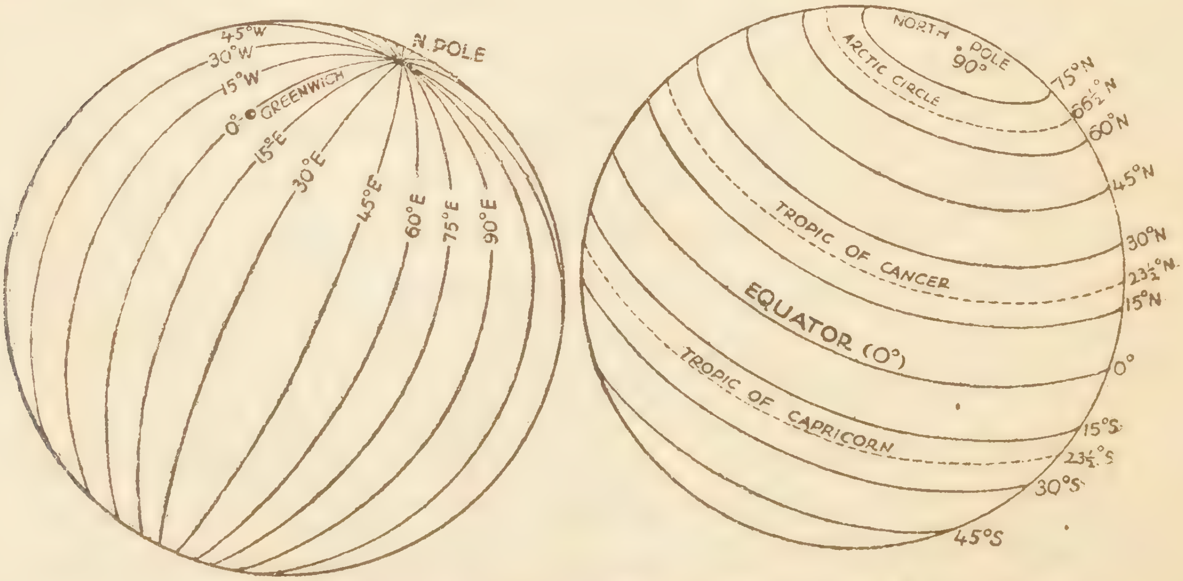


FIG. 6. Parallels of Latitude and Lines of Longitude.

Longitude.—The latitude of a place alone cannot fix its position, for it may be anywhere along its parallel of latitude. We should know also its distance east or west of a line passing from pole to pole. Such a line is first drawn through Greenwich (close to London) cutting the Equator at right angles. The distance of a place east or west from the *Greenwich line* is its *longitude.* This is also measured in degrees. The Greenwich line is marked 0° just like the Equator. At every 10° or 15° east and west of the Greenwich line, lines are drawn from N. P. to S. P. cutting the equator at right angles (Fig. 6). The line just opposite the Greenwich line is marked 180° The distance east of Greenwich line up to 180° is *East Longitude* and west of it is *West Longitude.* Note that the *Lines of Longitude* are not parallel, but meet at the poles and are half circles. The longitude of Madras is $80\frac{1}{4}°$ E.

The position of any point on the Earth's surface can be determined by stating its latitude and longitude ; it lies where the two lines represented by the given latitude and longitude meet.

As the earth rotates, all the places on any one of the lines of longitude come into sunlight at the same time. So places on the same line of longitude have midday at the same time ; hence the north to south lines are called *meridians* (*meri dies*=midday). Since the first-drawn meridian passes through Greenwich, it is called the *Prime Meridian.*

Variation in the length of a degree of longitude.—The circumference of the earth at the equator is nearly 25,000 miles. Therefore 1° of longitude along the equator $=\frac{25000}{360}$ miles $=69\frac{1}{2}$ miles nearly. Since the mean circumference is less than 25,000 miles we may take 1° of longitude on the equator to be about 69 miles. The parallels of latitude as seen on globes are drawn at equal intervals ; hence *a degree of latitude* may be taken as equal to about 69 miles. The lines of longitude, however, vary in their distance from one another. They approach towards the poles where they meet at a point. Hence *a degree of longitude* is about 69 miles at the equator only, and its length becomes less as we get nearer the poles. The following table gives the approximate length of 1° of longitude at different latitudes:

At the equator 1° long. = 69·00 miles.
At 10° N. & South ,, = 68·00 miles.
At 20° ,, ,, = 64·80 ,,
At 30° ,, ,, = 59·75 ,,
At 40° ,, ,, = 52·85 ,,
At 50° ,, ,, = 44·35 ,,
At 60° ,, ,, = 34·50 ,,
At 70° ,, ,, = 23·60 ,,
At 80° ,, ,, = 12·00 ,,
At 90° ,, ,, = 0·00 ,,

Longitude and Time.—(Fig. 4b): The relation between longitude and time has been discussed in the previous books. *Vide* N. America for time belts and standard time.

The Revolution of the Earth.—The sun is, like the earth, a ball, but it appears to be a small ball compared with the earth. This is because it is so far away; it is over 90,000,000 miles from the earth, but it is really much larger than the earth (1,300,000 times as large as the earth). In addition to its rotation, the earth has another motion. It moves like a tiny ball in space round the great sun in a path which we call its orbit. (Fig. 7). This movement of the earth we call its *revolution*. One such revolution takes about 365¼ days and gives the period called a *year*. The orbit of the earth is in one level or plane, and it is not a perfect circle, but an *ellipse* with the sun in one focus.

Inclination of the Earth's Axis.—From the school globe you can see that the axis of the earth is not vertical or upright, but sloping to one side. This slope we call the

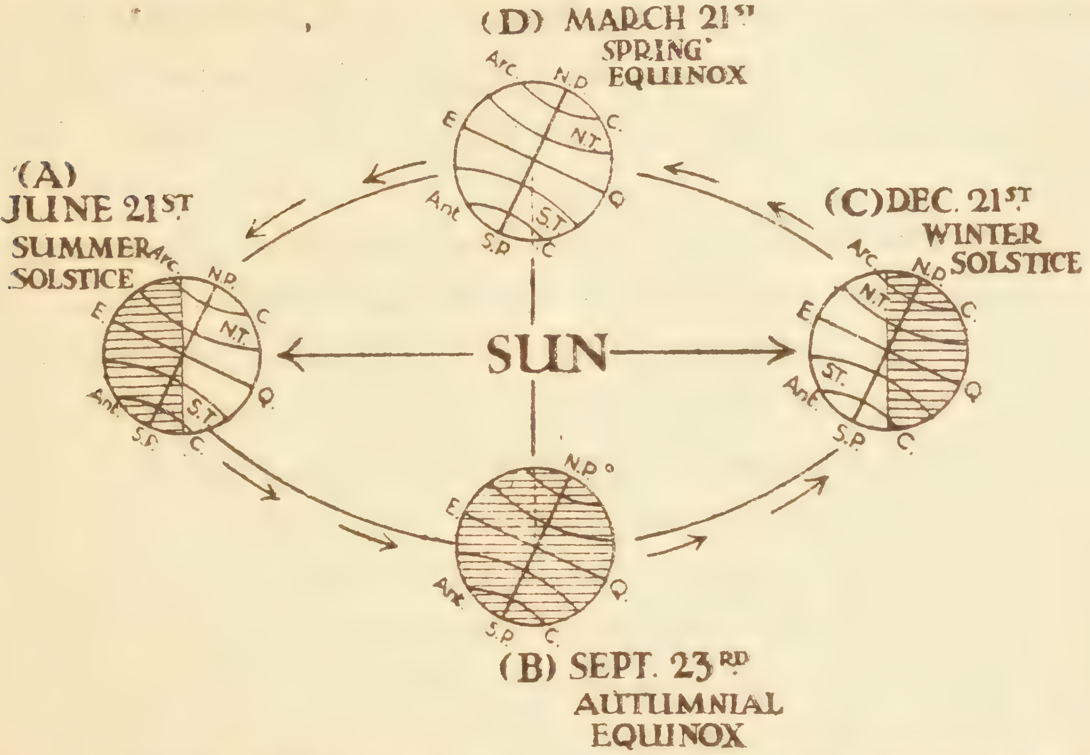


FIG. 7. Diagram showing (1) Revolution of the earth around the sun (2) the inclination and parallelism of the earth's axis.

inclination of the earth's axis. The amount of inclination of the earth's axis from the perpendicular to the plane of its orbit is about $23\frac{1}{2}^\circ$ *i.e.*, the axis makes an angle of $66\frac{1}{2}^\circ$ with the plane of the orbit. Again the axis *always points in the same direction* (Fig. 7) *i.e.*, it is said to be *parallel to itself* in whatever position the earth may be. Try, with the help of a lamp and a ball with a rod passing through its centre, to find out what would happen if the axis of the earth were to be perpendicular to the plane of its orbit or more inclined than it is now.

The inclination of the earth's axis, its parallelism and the revolution of the earth cause changes of season, which make life on the earth possible and pleasant.

The four positions.—From figure 7 you can see that in one position the North Pole (N) is inclined towards the sun, and in the opposite position it leans away from it. At two other positions the axis is presented exactly sideways to the sun, so that neither pole inclines towards or from the sun. This can be seen clearly by arranging four school globes on a table with a lamp in the centre.

Position A.—Let us now consider one of the positions (A) where the North Pole is turned towards the sun. (Fig. 8) This occurs on June 21. The sun is overhead at noon 23½° N. of the equator. Each place on the circle traced round the earth at this point receives the vertical rays of the sun; therefore this belt receives the greatest possible amount of heat. This circle is called the *Tropic of Cancer*. Again the rays of the sun fall 23½° beyond the North Pole and fall short of the South Pole by the same angle. These limits fix the *Arctic* and *Antarctic circles*. All places within the Arctic circle (66½° N.) are in the light the whole of the 24 hours; while within the Antarctic circle (66½° S.) the sun is invisible. All places in the northern hemisphere have longer light than darkness; while in the southern hemisphere the period of darkness is longer than that of light. Hence it is summer in the northern hemisphere and winter in the southern hemisphere.

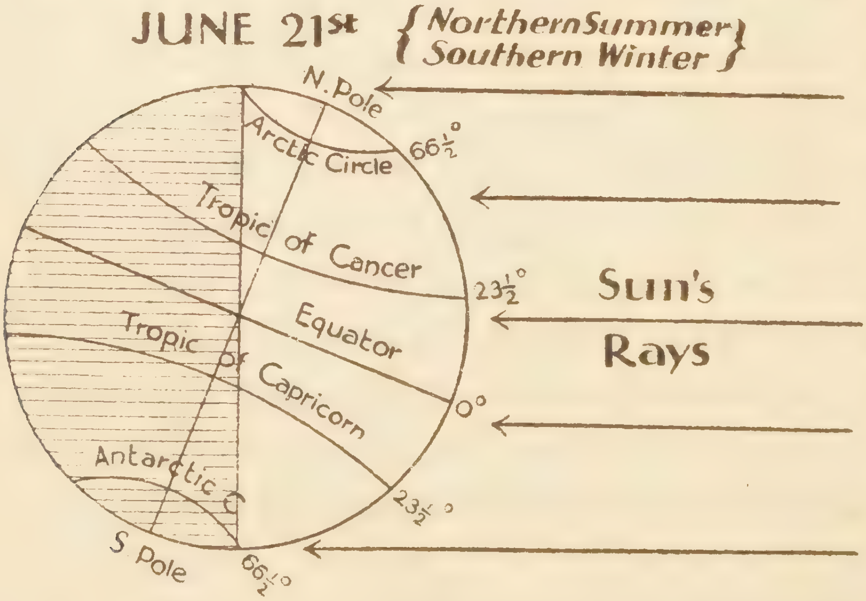


FIG. 8. Position of the earth with regard to the sun at the summer solstice.

Position C.—Six months later, on December 21, the south end of the axis is tilted towards the sun and the north end away from the sun (Fig. 9). The conditions are just the reverse of those on June 21, the northern hemisphere having winter while the southern hemisphere, has summer The sun is seen overhead at noon 23½° S. of the equator. The line along which all places come directly under the sun is called the *Tropic of Capricorn.*

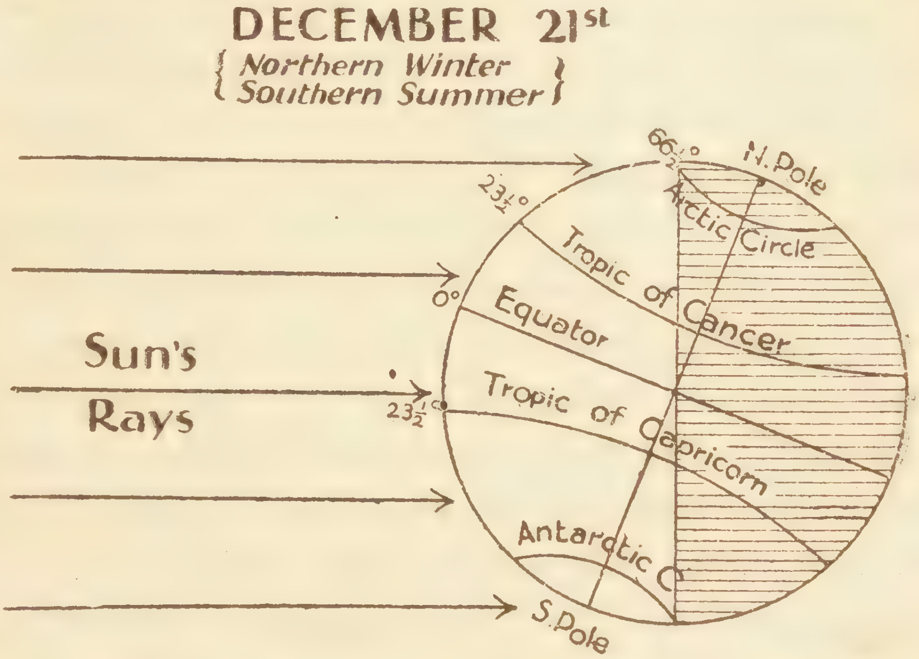


FIG. 9. Position of the earth with regard to the sun at the winter solstice.

Positions B & D.—On March 21 and September 23, the axis of the earth is presented sidewise to the sun (Fig. 10). The sun is overhead at the equator. The poles are on the edge of light and darkness, and all other

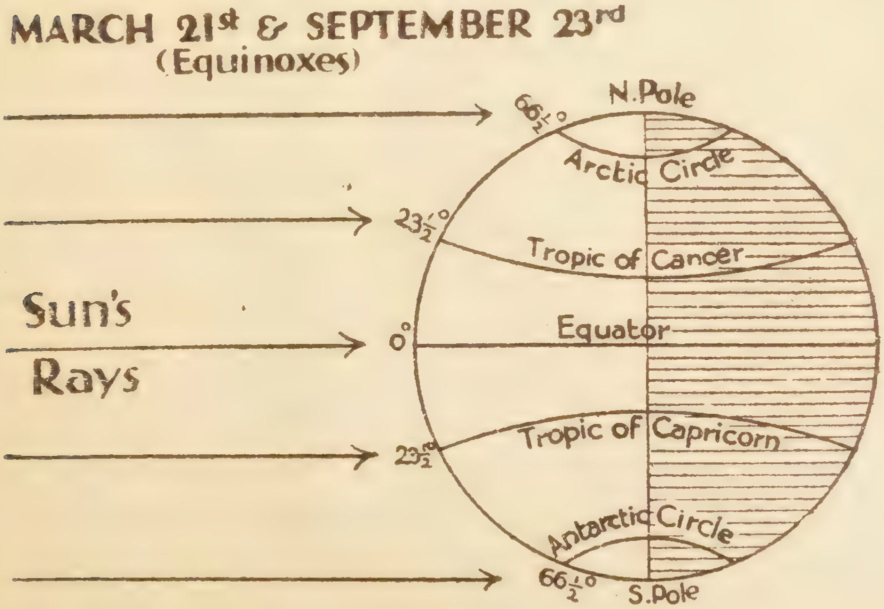


FIG 10. Position of the earth with regard to the sun at the equinoxes.

places are half the time in the light and half the time in the dark. These two dates are called *Equinoxes* (=equal night times), and every place has equal day and night. March 21 is called the *Spring or Vernal Equinox*, and September 23 is the *Autumnal Equinox.*

The Solstices.—We see the sun 'swinging' northward and southward between the two tropics. The tropics (=turning places) are so called because they are the turning-places of this swing of the sun. On June 21 the sun reaches the northern limit of its apparent migration and seems to stand still before its journey southward. This day is called the *Summer Solstice* (=stopping-time). Similarly, Decemher 21 is known as the *Winter Solstice*; *Cf.* *Dakshana* and *Uttara Ayanams.*

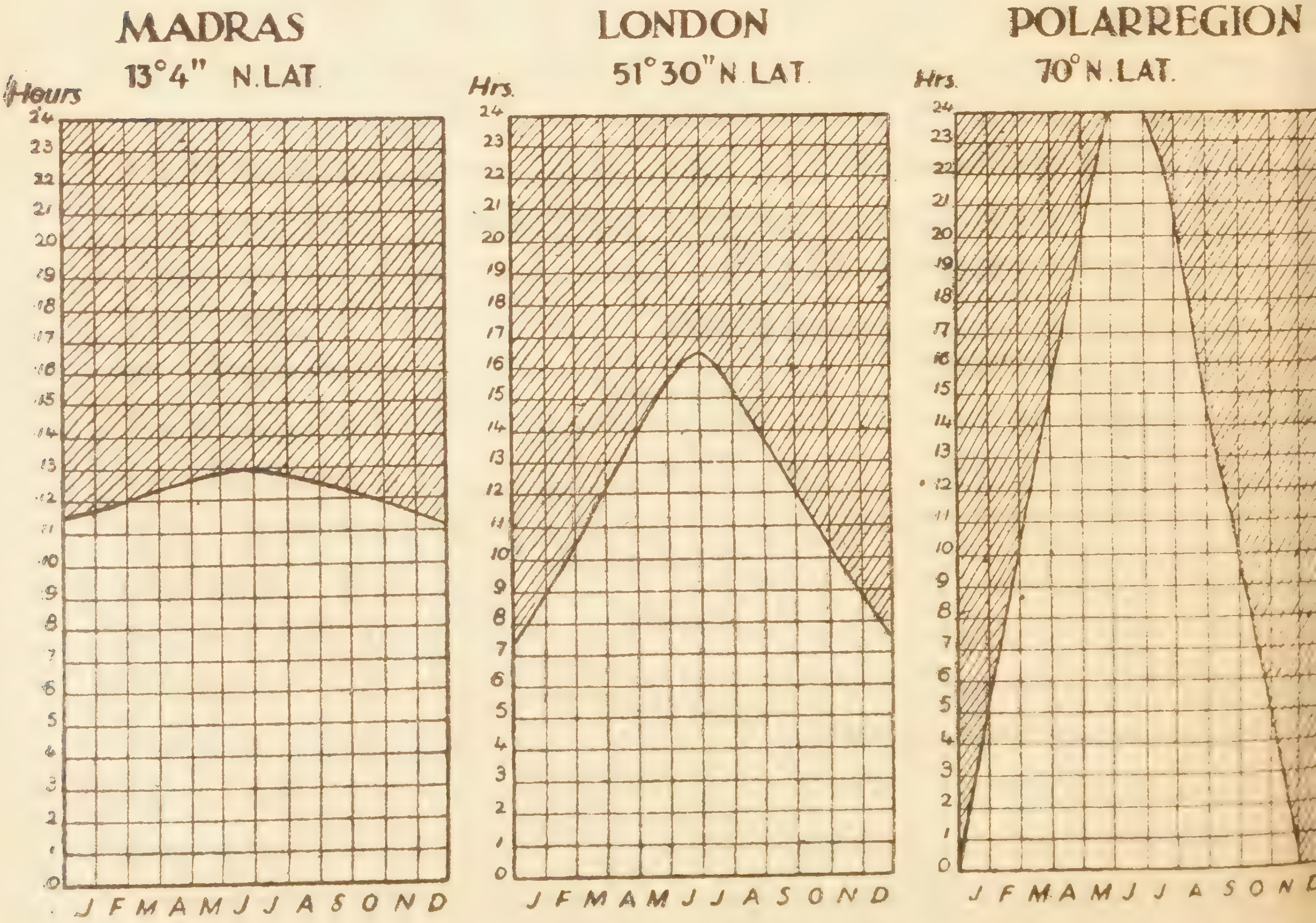


FIG. 11. Diagram showing Duration of Daylight in different latitudes.

The Lengths of Day and Night.—Figures 7 to 10 show that throughout the year half the equator is in the light and half in the darkness. So at the equator day and night are equal *i.e.*, the days are always 12 hours in length. In summer, June 21, (Fig. 8) all the region within the Arctic circle is in the light all the 24 hours. Between the equator and the Arctic circle, all places move in the light longer than in the dark, but the length of day increases with the increase in latitude. In winter, December 21, (Fig. 9) all region within the Arctic circle is in the dark during all the 24 hours, and other places in the northern hemisphere have longer nights than days. At the north pole the day lasts six months from March 21 to September 23. On June 21 all places in the northern hemisphere have the longest day, and on December 21, the longest night. Figure 11 illustrates the variation in the length of day and night in different latitudes : Madras, London and 70° N. Lat.

The Seasons.—(Fig, 12) Near the equator the mid-day sun is always more than $66\frac{1}{2}°$ above the horizon so that the heat received there is always very considerable. There is not much difference between one part of the year and another. In the polar regions although the sun shines for several days (varying from 24 hours at the Arctic circle to six months at the poles without going below the horizon, it does not give great heat ; for even at midsummer (June, 21) it is only $23\frac{1}{2}°$ above the horizon. In the equatorial belt it is always hot and in the polar belt it is always cold. But in the intermediate regions we see a clear difference in temperature between one part of the year and another. The differences are due to the revolution of the earth and the inclination and parallelism of its axis. This inclination brings the northern and the southern hemisphere under the *more direct rays of*

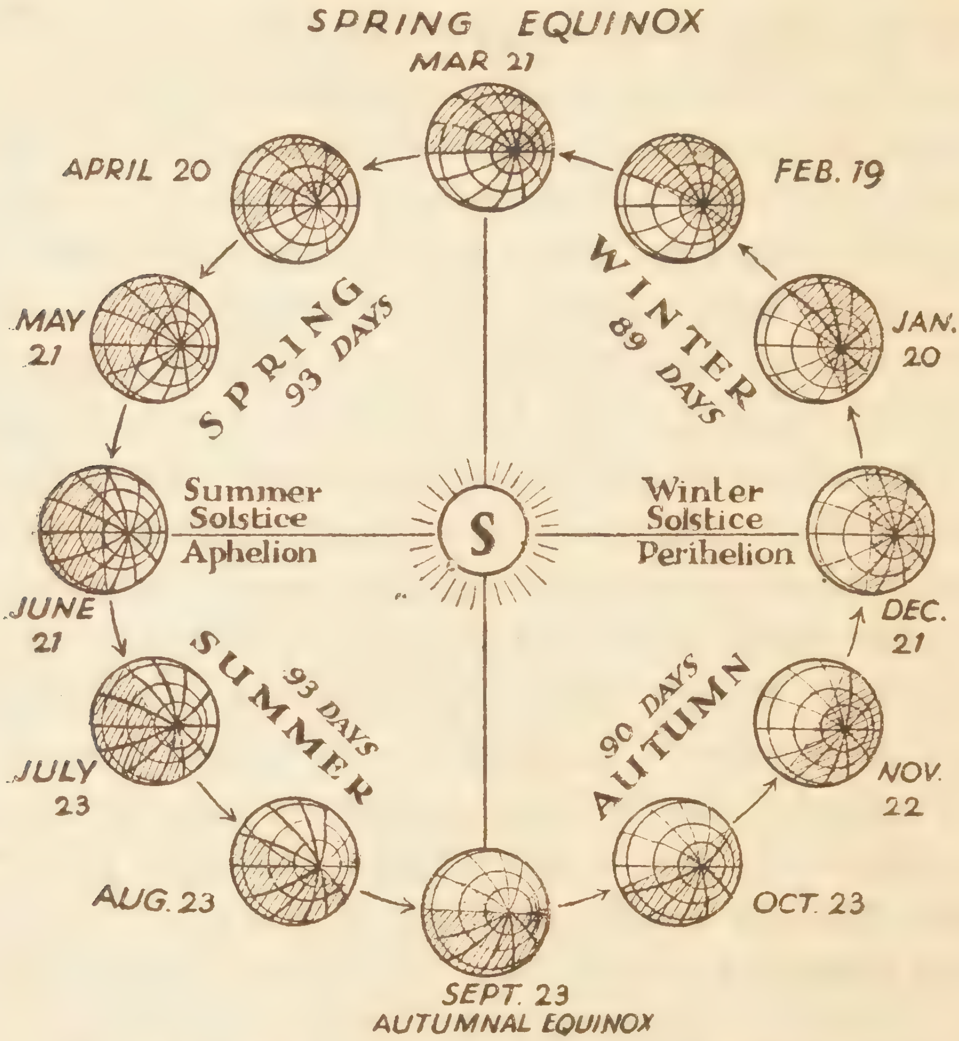


FIG. 12. The Seasons of Northern Hemisphere.

the sun, and for *a longer time alternately.* When the days are long and the sun's rays are more direct, the temperature is high, but when the midday sun is low in the sky and the days are short the temperature is comparatively low. Summer is associated with long days and high altitude of the noonday sun, and winter, with short days and low altitude.

In the temperate regions the year is definitely divided into four quarters each being known as a *season*. Fig. 12 shows the seasons in the northern hemisphere. On March 21, the Vernal or Spring Equinox, *Spring* begins. On June 21 the Summer Solstice, *Summer* begins. On September 23, the Autumnal Equinox, *Autumn* begins. The

Winter Solstice is on December 21 and *Winter* begins. Though astronomically these dates are the beginnings of these seasons, they are really the middle of the respective seasons. Note that the seasons are of unequal length. Spring and summer together in northern hemisphere are about 7 days longer than autumn and winter. The cause of the inequality is the varying speed of the earth in its orbit.

The earth is nearer the sun in northern winter than in summer. It is then at *Perihelion* (=round about the sun). It might seem that the southern hemisphere would receive more heat than the northern; but this is not so, for the earth travels faster round the sun at Perihelion than at *Aphelion* (=away from the sun).

In the southern hemisphere the seasons are reversed; December 21 is midsummer, March 21 is mid-autumn, June 21 is mid-winter and September 23 is mid-spring.

EXERCISES

(1) Explain what is meant by latitude and longitude. Show how the latitude and longitude of a place enable you to fix its position.

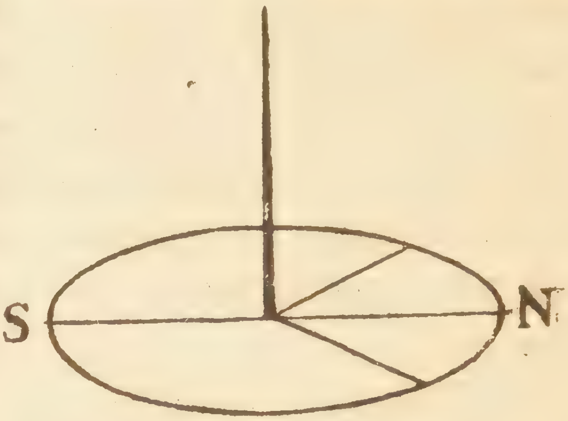
(2) Explain why the length of a degree of latitude is nearly the same in all latitudes, while that of a degree of longitude diminishes as latitude increases.

(3) A person at the N. Pole has the Pole Star right over his head: if he goes to the equator he sees the star at the horizon. Suggest a way of finding the latitude of your place with the help of the Pole Star.

(4) Show how the rotation of the earth causes the alteration of day and night. What would happen if the earth did not rotate?

(5) Find the meridian of your place. [Erect an upright rod on a platform in an open space. Draw a circle round the pole. Mark the shadow of the post just when it reaches the

circle both before and after noon. The line bisecting the angle between the shadows is the meridian or north to south line]. With the help of this line, how can you fix the exact time of noon on any day?



(6) Keep a record of the length and direction of the shadow of the post at noon observed on any particular day of each month. Infer the gradual swinging of the sun north and south of your latitude. From what else can you infer this? Find the dates when the sun is actually overhead in your locality.

(7) Measure the altitude of the sun at noon. [Fasten a string to the top of the stick and draw it tightly to the end of the shadow. Measure the angle which the string makes with the tip of the shadow. This gives the height of the sun above the horizon.] Draw a diagram showing height of stick and length of shadow, and verify the angle.

(8) Make these observations and measurements on June, 21 Sept , 23, Dec., 21 and March 21. With the help of the altitude of the sun deduce the latitude of your place. What will be the height of the sun at noon on these dates at Madras (13° N.)?

(9) In what respects will the observations made in London be different from those made in your locality? Give reasons.

(10) What do the Tropics of Cancer and Capricorn and Arctic and Antarctic circles mark?

(11) Explain why the days are longer (i) in summer than in winter; (ii) in England than in India in July.

(12) Explain the terms: tropics, solstices, equinoxes, aphelion the land of the midnight sun.

CHAPTER II

THE DISTRIBUTION OF TEMPERATURE

Direct and Slanting Rays.—The state of the air with regard to heat is called its temperature. The sun is the source of heat. You have already learnt that the sun's rays are warmer near the equator than at the poles. The midday sun at the equator is never less than $66\frac{1}{2}^\circ$ above the horizon, and so its rays fall very directly every day; while, at the poles, the midday sun is never more than $23\frac{1}{2}^\circ$ above the horizon so that its rays always fall very slantingly. Hence the difference in temperature between the equator and the poles must be due to the difference in the inclination of the sun's rays. You should have noticed the difference between the heating power of the slanting rays of the morning or evening sun and that of the direct rays of the midday sun.

Why should slanting rays have less heating power than direct rays? Study (Fig. 13-I). You see three bundles of rays of equal size falling on the globe. The bundle striking the equatorial belt (*ab*) falls directly, the bundle striking the south temperate region (a_1b_1)

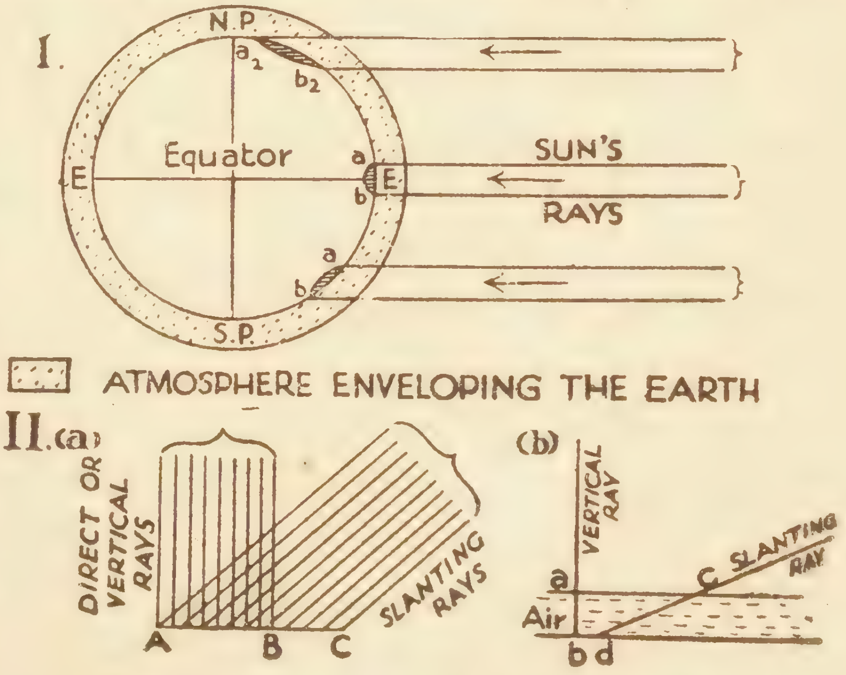


FIG. 13. Direct and Slanting Rays.

falls more slantingly and the bundle striking the north polar region $(a_2\ b_2)$ falls more slantingly still. You see that the most direct rays fall on the smallest area (ab) and the most slanting rays fall on the largest area $(a_2\ b_2)$. Hence the more slanting the rays are, the larger is the area over which they are spread (Fig. 13 IIa) and the less becomes their heating effect. Again the slanting rays have to pass a longer distance through the atmosphere than the direct rays and so, suffer greater loss. (Fig. 13 II b)

It is owing to the difference between the slanting and direct rays that equatorial regions are hotter than regions farther north or south.

The Zones.—(Fig. 14). Between the Tropic of Cancer ($23\frac{1}{2}°$ N.) and the Tropic of Capricorn ($23\frac{1}{2}°$ S.) every place has the sun overhead at least twice a year and the sun's rays fall more or less directly. Hence the temperature is high and this belt is called the *Torrid Zone.* The belts round the N. and S. poles bounded by the Arctic ($66\frac{1}{2}°$ N.) and Antarctic ($66\frac{1}{2}°$ S.) Circles respectively receive the most slanting rays, and hence the temperature is very low. These belts are called the *Frigid Zones.* Between the tropics and the polar circles lie regions of moderate heat called the *Temperate Zones.* Between the Tropic of Cancer and the Arctic Circle lies the North Temperate Zone and between the Tropic of Capricorn and the Antarc-

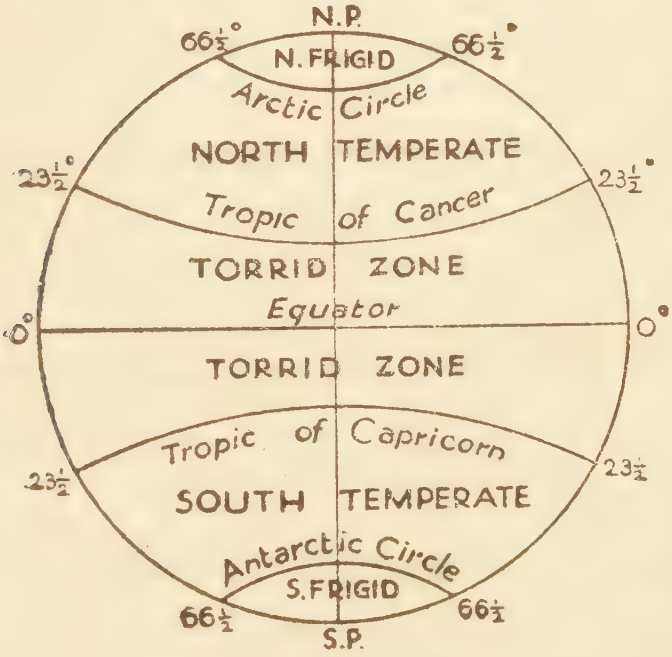
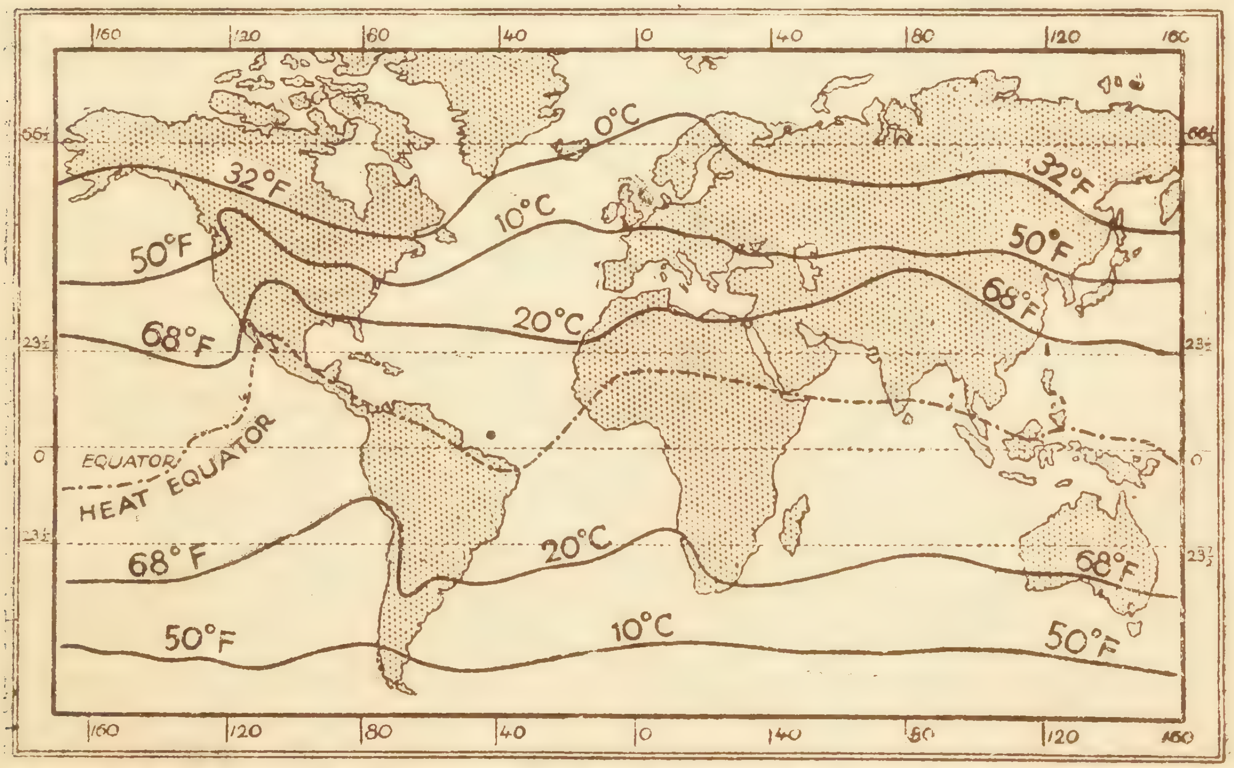


FIG. 14. The Zones

tic Circle lies the South Temperate Zone. These zones are bounded by certain parallels of latitude fixed by the apparent position of the sun in the course of a year. These are not *true heat zones* as their boundaries do not show any particular temperature. All places on the same latitude do not have the same temperature, for temperature depends not only on latitude but also on altitude and distance from sea (*Vide* Australia Ch. II).

Isotherms and the True Heat Zones.—Therefore, true heat zones should be bounded not by parallels of latitude but by lines passing through all places having the same average temperature. Such lines of equal temperature are called *isotherms*. It is usual, to draw the isotherms as they would be if all the land were at sea level. Study figure 15 which shows the April temperatures of the world reduced to sea-level. The belt of greatest heat lies



OVER 68°F = HOT; 68°-50°F = WARM; 50°-32°F = COOL; BELOW 32°F = COLD ZONES.

FIG. 15. Mean sea-level temperatures for April.
The Map shows the true heat Zones and the Heat Equator.

in equatorial regions, and temperature decreases gradually towards the poles. This map represents the distribution of temperature when the sun is vertically overhead at noon at places near the equator. Which other monthly temperature map would show almost the same distribution of temperature? The belt bounded by the 68° F. isotherms is the *hot zone*; The belts lying between 68° F. and 50° F are *warm temperate zones*; those lying between 50° F. and 32° F. are *cool temperate zones*: and the belts lying beyond the 32° F. lines are *cold* or *frigid zones.* The figure also shows the *Heat Equator*, *i.e.*, the line of greatest heat. Note that it differs from the astronomical equator.

The January Temperature Map.—(Fig. 16). Observe the following facts on the map:—(1) The belt of greatest heat has shifted south of the equator as the sun is overhead at noon near the Tropic of Capricorn. (2) The highest temperatures (over 86° F.) are to be found over the land massess of the southern continents. (3) In the northern

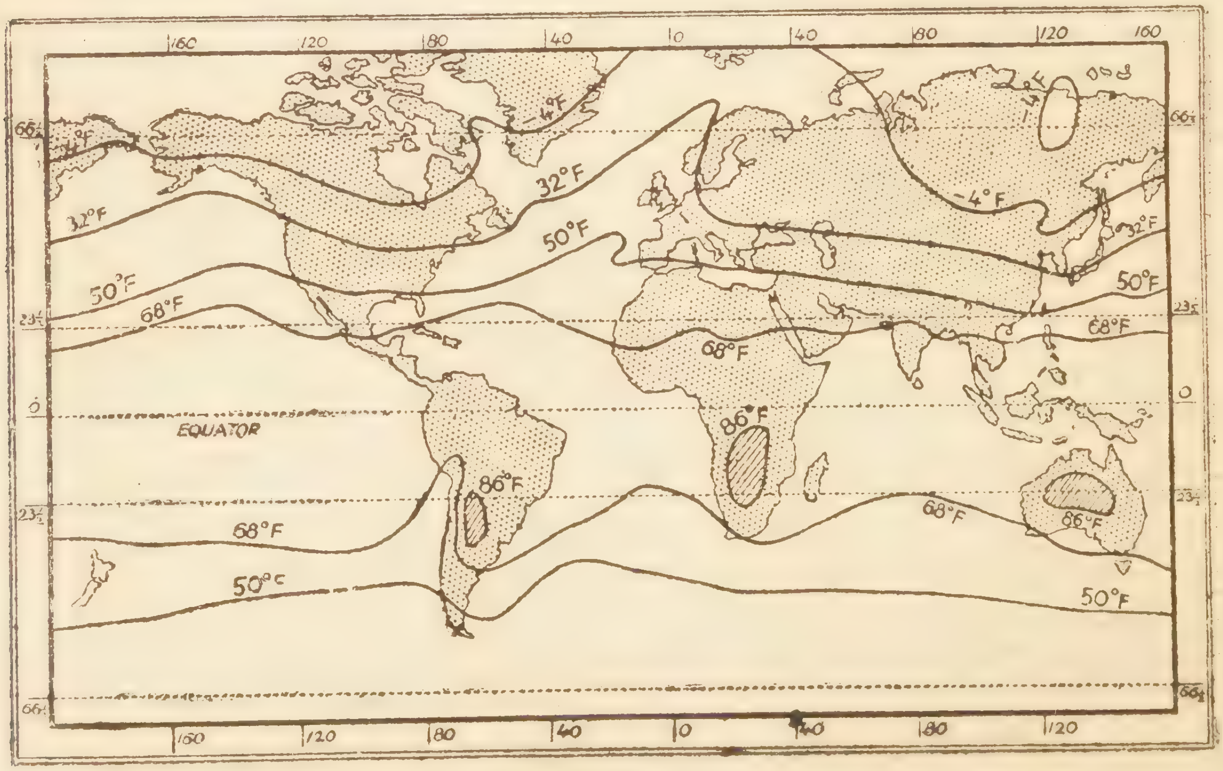


FIG. 16. Mean Sea-level Temperatures for January.

continents the isotherms bend away from the equator over the oceans, but towards the equator over the lands. The 32° F. isotherm gives the best illustration of this. This can be accounted for partly by the unequal heating of land and water and partly by ocean currents. (Fig. 21) (4) In the southern hemisphere the isotherms bend northwards near the west coasts of the land masses and southwards off their east coasts. This is due to the cold currents flowing northwards along their west coasts and the warm currents flowing southwards along their east coasts. (5) The coldest part of the world is in northern Siberia wherein lies the 'cold pole'. (6) A vast area in North America and a still vaster area in Eurasia lie north of the 32° F. isotherm so that in these areas the temperature is below freezing point. What can you infer about the rivers, lakes, canals and seas in these areas?

The July Isotherm Map.—(Fig. 17): The sun has migrated northwards and is overhead at noon near the

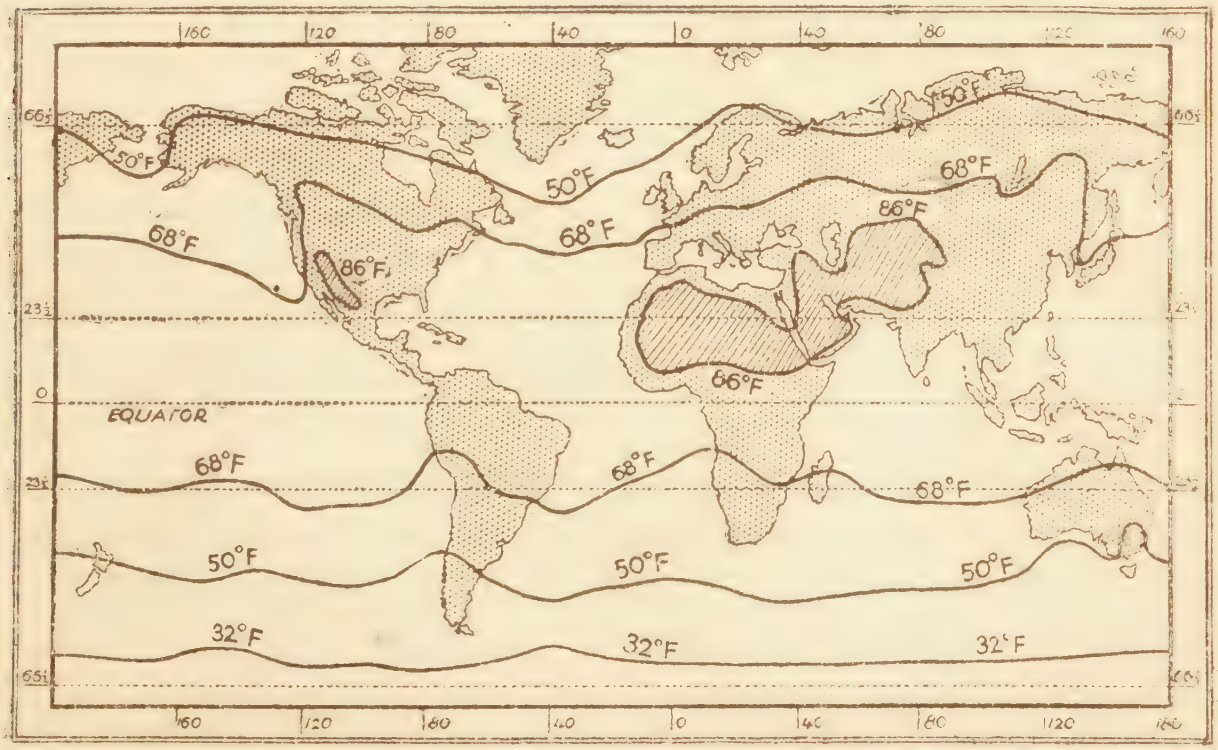


FIG. 17. Mean Sea-level Temperatures for July.

Tropic of Cancer. Note on the map (1) The shifting of the heat belt into the northern hemisphere; (2) The areas of greatest heat (over (86° F.) lying over North America, North Africa and South-west Asia; (3) The northward bend of the isotherms over the land masses in the northern hemisphere; *e.g.*, the 68° F. isotherm reaches within 7° of the Arctic circle over the rapidly heated land-masses of Asia, but is only at 40° N. over the slowly heated oceans; (4) No part of the lands of both the northern and southern hemispheres is below 32° F.

Range of Temperature.—If you make a tracing of the July map and place it over that for January you can find out the range of temperature of certain places. The range is greater over the lands than over the oceans, and much greater in the Temperate than in the Torrid Zone. (*Vide* Eurasia Fig. 6)

EXERCISES

(1) Keep a weather record showing daily maximum and minimum temperature. Find the mean temperature of each day; add the mean temperatures of all the days of a month and divide the result by the number of days in the month. The result is the mean temperature for the month. How will you find the mean temperature for the year?

(2) Why is it warmer in equatorial regions than in Polar regions?

(3) 'The zones limited by the tropics and polar circles are not true heat zones.' Why? What are true heat zones then?

(4) Explain why (i) Bangalore is cooler than Madras; (ii) Moscow has a greater range of temperature than London.

(5) 'The belt of greatest heat swings further north of the equator in July than it does south of it in January.' Why?

CHAPTER III

THE DISTRIBUTION OF PRESSURE AND WINDS

Pressure and Wind.—The earth is surrounded by air which extends to a height of about 200 miles from its surface. This air has weight and therefore exerts a pressure upon the surface of the earth. This pressure is greater at sea-level than on the top of a mountain. Air pressure is measured by means of the barometer, and the normal pressure at sea-level is about 29·9 inches. When the pressure is more than 29·9 inches, it is said to be 'high' and when it is less than this, we speak of it as being 'low.'

You have already learnt that air always flows from places of high pressure towards places of low pressure and thus winds are caused. The greater the difference in pressure, the stronger blows the wind. Pressures are represented on maps by *isobars.* (North America Ch. IV).

What makes the pressure different in different places on the earth? It is the unequal heating of the air. Fig. 3 in Australia shows the distribution of pressure on the surface of the earth and Fig. 11 in Africa explains how low and high pressure belts are formed at the equator and at 30° N. & S. respectively. But then why are there low-pressure areas beyond the high pressure belts? The present distribution of high and low pressure belts is due to the combined effects of the distribution of temperature and the rotation of the earth. The first produces high pressure near the poles and low pressure at the equator. The second produces low pressure near the poles and high pressure at the equator. As a result of these two causes we have low pressure systems at the equator and about 60° N. and S. and a high pressure system about 30° N. and S.

You have learnt that the actual direction of the winds are modified by the rotation of the earth. The law of the deflection of the winds *to the right in northern hemisphere* and *to the left in the southern hemisphere*, owing to the rotation of the earth, is known as *Ferrel's law.* The explanation for this deflection is to be found in the difference in the velocity of the earth's rotation between the lower and higher latitudes. The earth rotates with a greater velocity near the equator than near the poles. The trade winds which blow from the high pressure belts towards the equator move from a place of lower velocity to a place of higher velocity, and therefore lag behind. Hence they seem to come from north-east and south-east. The anti-trades which blow from the high pressure belts towards the low pressure areas near the polar circles move from a place of greater velocity to a place of less velocity, and so they move in advance. Hence the anti-trades appear to come from the south-west and north-west.

This deflection of the winds can be shown by trying to draw north and south lines on a rotating globe. Rotate the globe from west to east. While it is rotating, by means of a piece of chalk, try to draw lines towards the equator. When you stop the globe you will find the lines deflected as in Ferrel's law.

WORLD DISTRIBUTION OF PRESSURE

October Pressure Map of the World.—(Fig. 18) Just as temperatures have to be corrected to sea-level, so barometric readings have to be corrected for altitude and temperature. Fig. 18 shows the average sea-level pressures for the month of October when the sun is seen overhead at noon near the equator. Notice on the map: (1) A belt of low pressure in the equatorial regions. (2) Two belts of high pressure between latitudes 20° and 40° N. and S. (3) Outside these between latitudes 50° and 60° N. and S. there are low pressure belts. This distribution corresponds nearly with that shown in Fig. 3 (Australia). Compare this map with the temperature map for April (Fig. 15) You have seen the equatorial heat belt shifting north and south with the migration of the sun north and south of the equator. Correspondingly the belts of low and high pressure, and with them the belts of calms and winds, will also shift with the season.

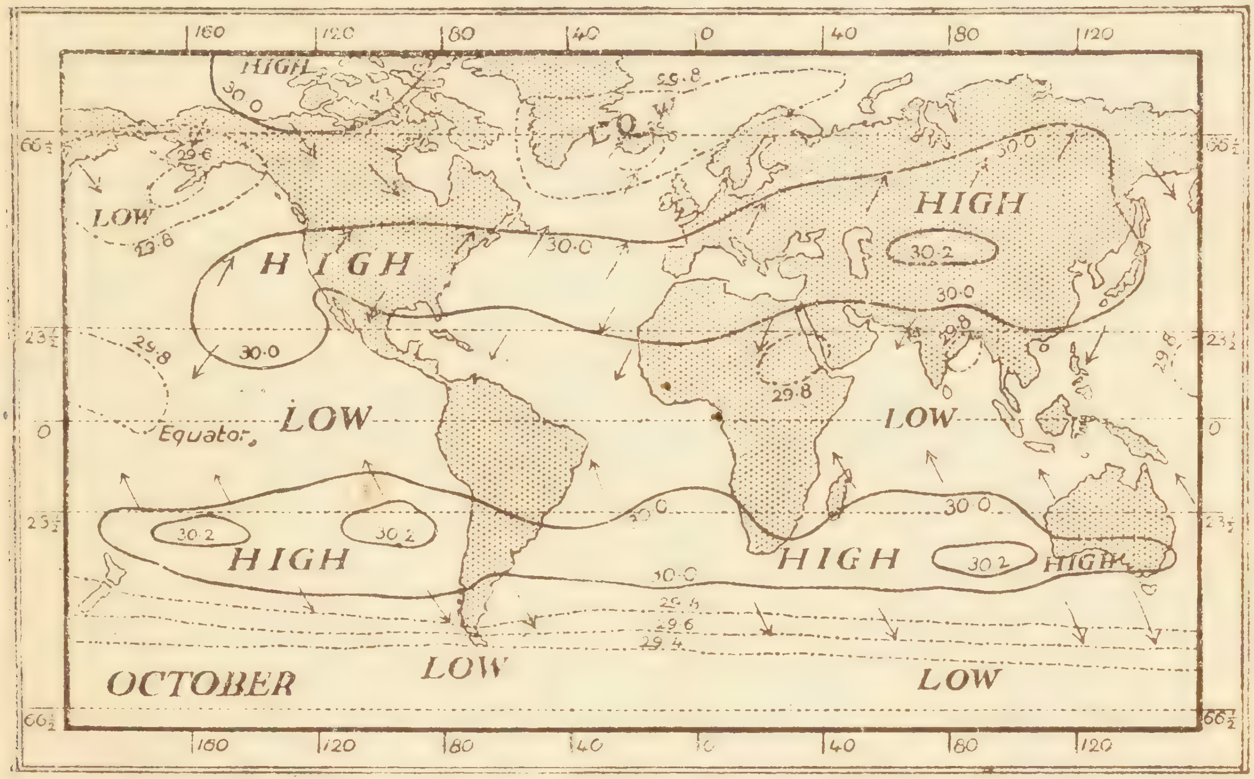


FIG. 18. Pressure and Winds—October

Pressure and winds in January.—(Fig. 19) Notice on the map:—(1) The equatorial low pressure has moved southwards. (2) The southern high pressure belt is not so continuous as in October and there are distinct low-

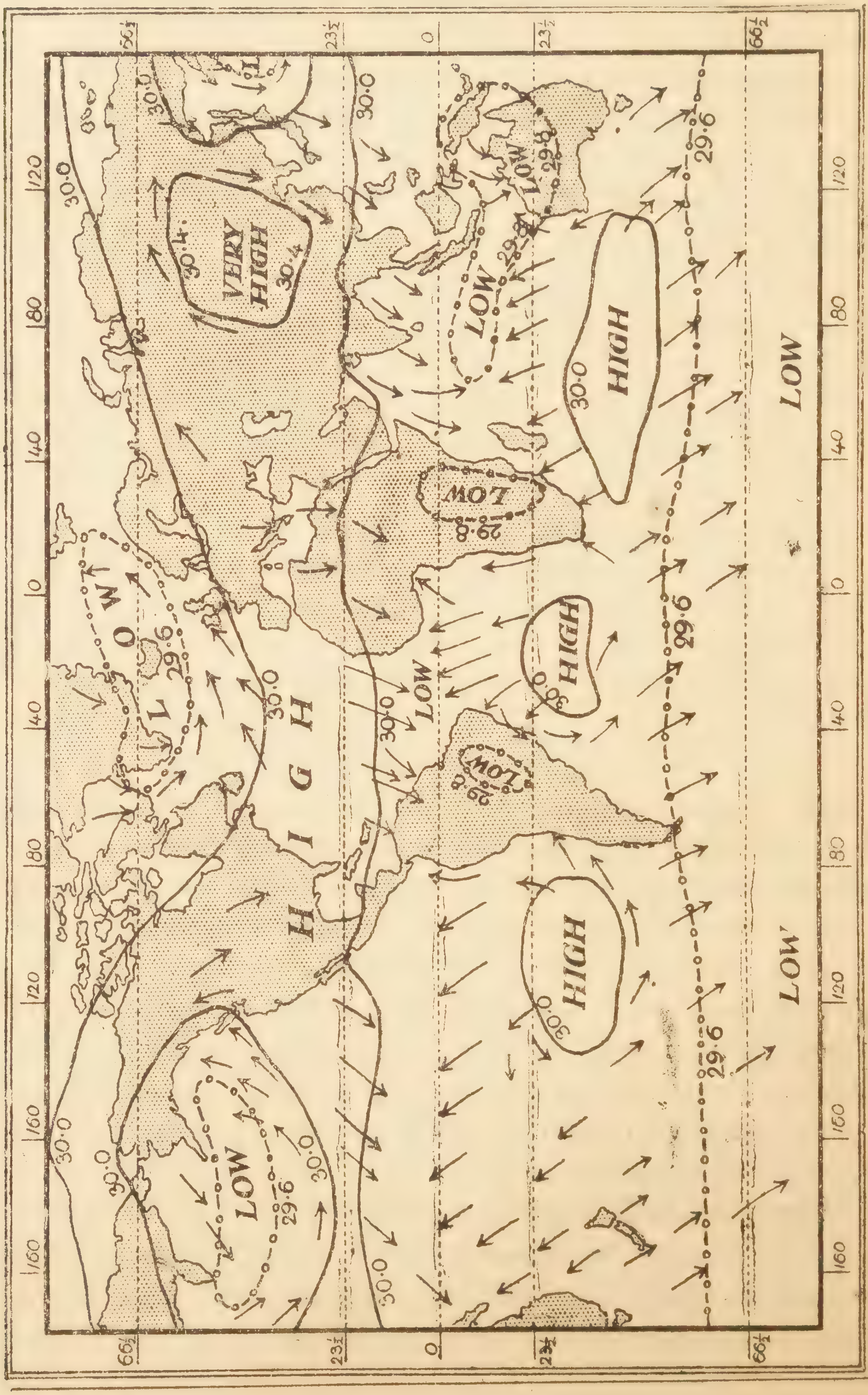


FIG. 19. Pressure and Winds—January

pressure areas over the land masses of South America, Africa and Australia. (3) In the northern hemisphere the high-pressure belt is well marked, especially over the land masses, the pressure being the highest over Asia. (4) Over the North Atlantic and Pacific Oceans are well-defined low-pressure areas. Here you see the influence of land and water over the distribution of pressure. (5) In the southern hemisphere the belt of north-westerlies is not interrupted by any great land mass; but the belt of south-westerlies in the northern hemisphere is broken by the high pressure systems forming over the continents of North America and Asia. (6) The south-westerlies tend to form great swirls of air (cyclones) round the low-pressure centres over the ocean. (7) In North-western Australia a low-pressure centre is formed towards which winds blow. These form the north-west monsoon of Australia.

Pressure and winds in July.—(Fig. 20) Note on the map: (1) There is a general northward shifting of the wind belts. (2) In the southern hemisphere, the high-pressure belt is continuous as temperature differences between land and water are not very great. (3) In the northern hemisphere, the high pressure belt is not continuous; over the oceans are areas of high pressure, and over the continents areas of low pressure (4) The low-pressure area over the continent of Asia is very well marked, the centre of lowest pressure lying over the Indus basin. (5) In this season Asia is under the influence of a low-pressure system with inflowing winds, while in January it is under the influence of a high-pressure system with outflowing winds. This change in the distribution of pressure gives South-east Asia its distinctive "Monsoon" type of climate (6) The winds blowing towards the low-pressure centre are south-westerly in India and

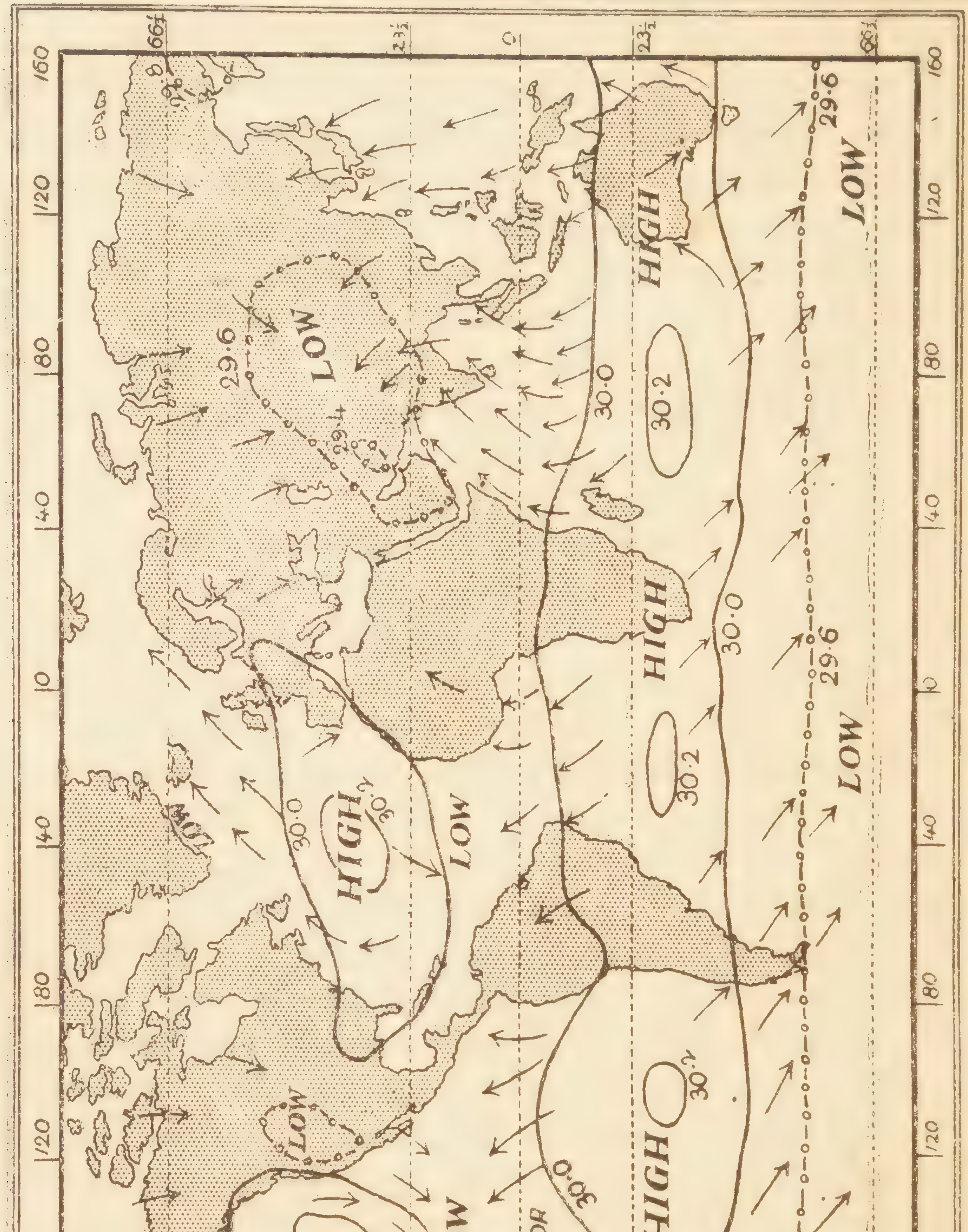


Fig. 20. Pressure and Winds—July

Burma, and southerly and south-easterly in Eastern Asia. (7) In Australia a high pressure system is developed, and strong south-easterly winds blow out over Northern Australia. This part of the continent is also a monsoon land.

For a detailed study of the *monsoons*, *vide* Eurasia and India. The monsoons are *seasonal* winds, while the trades and antitrades *are constant* winds. For *Cyclones and Anticyclones vide* N. America Ch. IV.

EXERCISES

(1) Explain : Doldrums, Horse Latitudes, Roaring Forties, Ferrel's Law.

(2) What is meant by a *belt of calms?* Where do you find it? Why?

(3) Give an account of the monsoons of the Indian Ocean. In what other parts of the world are monsoons found?

(4) Describe a cyclonic and an anticyclonic system of winds.

(5) 'Continental areas form low-pressure centres in summer and high-pressure centres in winter.' Why?

CHAPTER IV

OCEAN CURRENTS

The surface temperature of the ocean in tropical regions is about 80° F. and in the polar regions about 28° F. Hence there is a surface flow of water from the equator towards the poles, and a creep of cold water along the ocean bed from the poles towards the equator. Why? But this is not sufficient to account for the extensive movements of the surface waters of the oceans, known as *ocean currents.* There can be no doubt that these are set up mainly by the prevailing winds, for in regions where the winds change with the seasons as in the North Indian Ocean (Fig. 21) the direction of the currents also changes. Again in the trade-wind belts the water is driven westward, and in the region of the westerlies the water is driven eastward.

Ocean currents may be classified as warm and cold currents. They are also classified as *stream* or *drift* currents. Stream currents are deep and swift flowing between comparatively still waters (*e.g.* Gulf Stream). Drift currents move more slowly, and are merely a general forward movement of surface water (*e.g.* North Atlantic Drift).

Refer to the map showing ocean currents (Fig. 21). Notice in the *Atlantic* and *Pacific*:—

(1) A westward flow of warm water north and south of the equator.

(2) A *counter* current running eastwards along the equator.

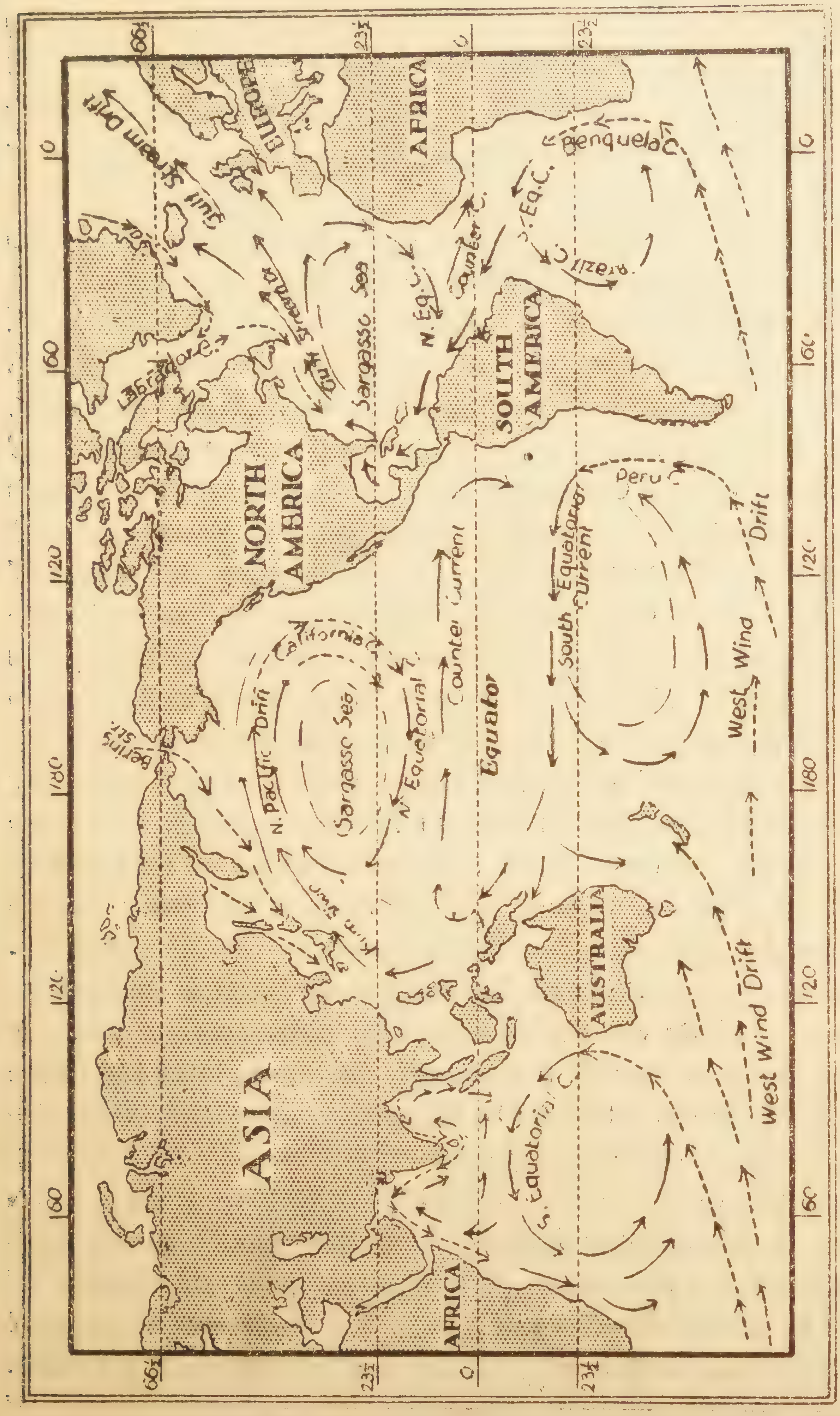


FIG. 21. OCEAN CURRENTS: The dotted arrows in the N. Indian Ocean show the currents of the N. E. Monsoon, the other arrows those of the S. W. Monsoon. Elsewhere the dotted arrows show relatively cold currents, the others warm currents.

(3) Two great *eddies* in each ocean—one north of the equator and another south of it.

(4) The cold Antarctic current or West wind Drift flowing northwards along the western shores of the southern continents.

(5) A cold current creeping from the Arctic down the eastern shores of Asia and N. America.

Currents of the Atlantic.—The N. E. and S. E. trades set up the warm *North Equatorial* and the *South Equatorial* currents which run due west. Between them, but in the opposite direction, runs the *Counter Equatorial Current* or Guinea Current. The South Equatorial Current which is supplied by the Benguela current, a relatively cold current, is split into two by the wedge-shaped corner of South America. One branch goes south as the warm Brazil current, and the other north-west into the Caribbean sea and the Gulf of Mexico to mingle with the warm waters poured into the gulf by the North Equatorial Current.

From the Gulf of Mexico issues the *Gulf Stream.* By the time it reaches the latitude of Newfoundland, it ceases to be a *stream* current, and spreads out its waters on the surface like an enormous fan, mixing with other warm water which has drifted from outside the West Indies. This Gulf Stream Drift or North Atlantic Drift is pushed on by the prevailing westerlies towards western Europe. A branch of this bends southward and completes the great *eddy* of the North Atlantic in the centre of which lies the "Sargasso Sea"—a floating mass of seaweed.

A cold current—the Labrador current—creeps down the east coast of North America. This comes from amongst the islands in the north and flowing past the coasts of Labrador and Newfoundland runs between the Gulf stream and the mainland. In the United States it is spoken of as the "cold wall." The fogs of Newfoundland are caused by the meeting of warm air carried by Gulf stream or its drift with the air cooled by the cold Labrador current.

In the South Atlantic the Brazilian current, after reaching the area of the westerly winds, passes across the ocean and joins the Benguela current along the west coast of South Africa to which vast quantities of cold water are supplied by the West Wind Drift from the Southern Ocean. Here again we have another Sargasso Sea.

In the Pacific Ocean we have the same arrangement of currents as in the Atlantic. In the trade-wind area there are the North and South Equatorial Currents. Between them is the Counter Equatoriel Current. The Kuro Siwo or Japan Current is the counterpart of the Gulf stream; the North Pacific Drift which reaches the coast of North America is the counterpart of the North Atlantic Drift; and the counterpart of the Labrador Current is the cold current coming through the Bering Strait. In the same way the currents of the South Pacific can be compared with those of the South Atlantic.

The circulation of the South Indian Ocean resembles that of the South Atlantic and the South Pacific; but in the North Indian Ocean the currents change their direction with the monsoons. The Counter Equatorial Current flows eastward only during the N. E. monsoon season.

Ocean Currents and Climate.—The influence of ocean currents upon climate is very great. Currents coming from equatorial regions are warm and those coming from polar regions are cold. These currents help to warm or cool the air above them, and make the ocean winds warmer or cooler, as the case may be. The south-westerly winds blowing over the British Isles are made warmer in winter by the Gulf Stream Drtft. The northward bend of the January 32° F. isotherm is due to the influence of this drift. The ports of British Isles and Norway are free from ice on account of the warm Gulf Stream Drift, while the Gulf of St. Lawrence on the opposite side of the Atlantic is frozen in winter on account of the Labrador Current. The east coasts of South Africa and South America are warmer than the west coasts, because the eastern shores are washed by warm currents and the western shores by cold currents.

EXERCISES

(1) Draw a diagram to illustrate the general arrangement of the ocean currents and show how their direction is dependent on the prevailing winds.

(2) Explain what is meant by (i) warm and cold currents; (ii) stream and drift currents; (iii) Sargasso Sea; (iv) cold wall.

(3) What effect have ocean currents on the directions taken by the 68° F. isotherms (January and July) in the southern hemisphere?

(4) Account for the following:
(i) The Baltic is frozen in winter while the coast of Norway is ice-free. (ii) The English Channel is free from ice while the Gulf of St. Lawrence in the same latitude is frozen for 3 months in winter.

(5) In what respect do the currents of the North Indian Ocean differ from the otner currents? Why?

CHAPTER V

RAINFALL AND VEGETATION

Evaporation and Condensation.—On the surface of the earth are oceans, lakes, rivers, etc. exposed to the atmosphere. From all these water is constantly being *evaporated* and received into the air as invisible water-vapour. If the air containing water-vapour is cooled, some of the water-vapour may be *condensed i.e.* turned back again into little drops of water. Mists, fogs and clouds are visible forms of water-vapour due to partial condensation. If the condensation proceeds further, the tiny drops of water run together to form big drops and as these are too heavy to float in the air, they fall as rain. If the temperature of the air from which the vapour condenses is below freezing point, then snow falls.

Most of the rain that falls on the lands comes from the seas which are the chief places where evaporation takes place. The moisture-bearing air is carried by means of winds to the land where it is cooled and the vapour is condensed and falls as rain. This rainwater is carried back to the oceans by rivers, so that there is a regular circulation of water from land to sea and from sea to land.

Causes of Rainfall.—We see that rain is the result of the cooling of air containing water-vapour. Air may be cooled: (i) if the air current blows from warmer to cooler latitudes, *e.g.*, the westerlies; (ii) if by any means the current is forced upwards to higher altitudes. In the latter as the air goes to regions where it is less and less compressed by the weight of air above it, it expands and, as a result of this expansion, cools. The truth of this statement can be easily understood by feeling the air which rushes out when you open the valve of a bicycle tyre and let the compressed air escape.

Air-currents may be caused to ascend in the following ways:—

(*a*) Winds are deflected upwards by a mountain range or the edge of a plateau that lies in their path. (Fig. 4 Australia) The higher the barrier, the higher must the air rise, the greater its expansion and cooling, and hence the heavier the rainfall. Such rains are called *relief rains*. There is a close connection between the relief and rainfall maps of most countries *e.g.* British Columbia, British Isles and South India.

(*b*) In low-pressure systems called cyclones, there is an ascending spiral movement of air which causes expansion and cooling and therefore condensation. Such rains are *cyclonic.* Much of the rain in the area of the westerly winde is due to cyclones.

(*c*) In the equatorial belt of calms the heated air is forced upwards by the winds which press in from either side. This air expands as it rises and cools, hence there is heavy rainfall in this area. Such rains, due to convection currents, are called *convection rains.*

Causes of Drought.—The causes of drought are just the reverse of the causes of rain. If air becomes warmer, its power to retain moisture increases, and so there will be no condensation. Hence wherever air is warmed, there it is dry. This warming of air occurs:—(1) if the air-current blows from cooler to warmer latitudes except where it is deflected upwards by mountains *e.g.*, the Trade winds ; (Note all the deserts of the world are in the trade-wind belts—especially on the west side of continnents) (2) if the air descends to lower altitudes. By descending, air is compressed and becomes warm, and its capacity for holding water-vapour is increased. Hence descending air currents are dry.

(*a*) On the leeside of high mountains air currents descend and are therefore dry. Hence there is no rainfall. The dry areas on the leeside of high mountains are called *rain-shadows, e.g.*, the Deccan plateu, Canada east of the Rockies and Patagonia.

(*b*) In high-pressure systems called Anti-cyclones, air is descending and therefore dry.

(*c*) The Horse Latitudes or high-pressure belts are marked by drought, because there, too, the air is descending and therefore dry. (Fig. 11 Africa)

DISTRIBUTION OF RAINFALL

Rainfall is usually estimated in inches and measured by means of a rain-gauge. Lines can be drawn through places having the same average rainfall for a given period. (*cf.* isotherms and isobars) Such lines are called *Isohyets* (=equal rain).

January rainfall map.—Fig. 22 shows the mean or average rainfall over the world for the month of *January*. Compare it with the January temperature and pressure maps. Notice the following:

(1) The belt of heavy rainfall is along the belt of greatest heat which lies *south* of the equator. The rainfall over large areas in South America and Africa is heavy.

(2) To the north and south of this wet belt are the high pressure and trade-wind dry belts. But the wet belt extends far down the east coasts of the southern continents as the south-east trades are on-shore winds here.

(3) In the latitudes of the south-westerlies the west coasts of the northern continents are wet (including Cali-

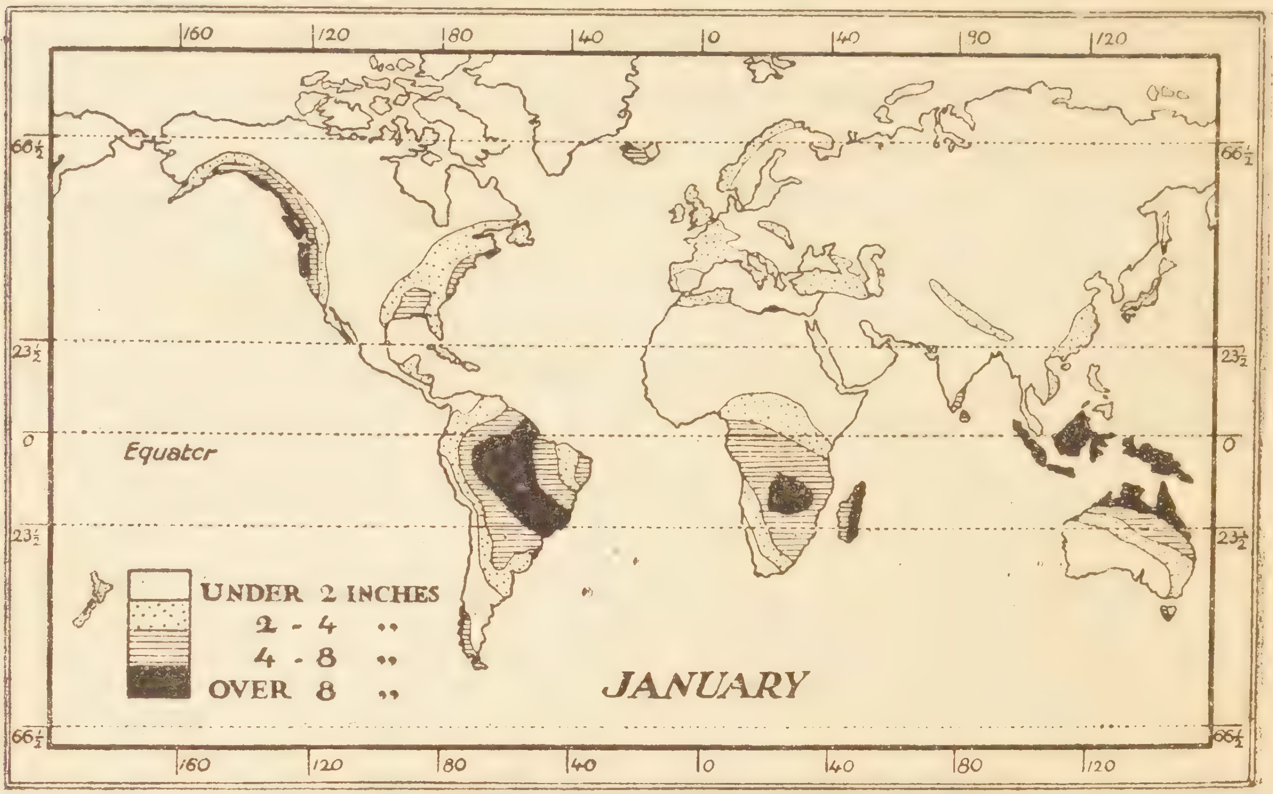


FIG. 22. THE WORLD: Mean Rainfall for JANUARY

fornia and N. Africa) and the interiors of the continents are dry as they form cold high-pressure areas.

(4) South Chile, Tasmania and the Southern Island of New Zealand receive rain from the north-westerlies.

(5) Asia is having its winter monsoon and so is dry on the whole. The out-blowing air from Eastern Asia is drawn in towards the low pressure region of Northern Australia where it gives rain as the summer monsoon.

July rainfall map.—Fig. 23 shows the average rainfall over the world for the month of *July*.

(1) The belt of heavy rainfall lies along the belt of greatest heat which is now *north* of the equator.

(2) Dry belts occur north and south of this; but in North America the dry area is found only in the west as in the east, the trade-winds extend the wet belt into the interior.

(3) On the west coasts of the northern continents, the south-westerlies are shifted north so that California and the

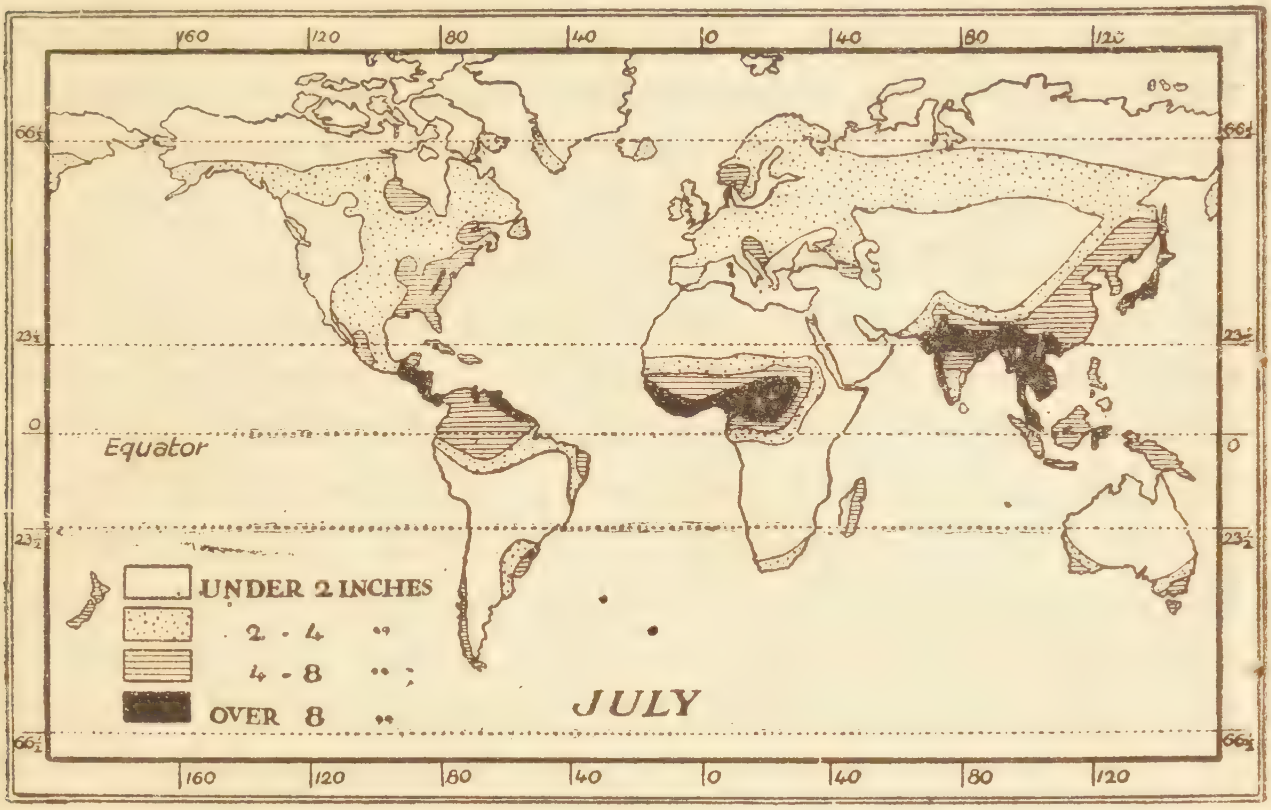


FIG. 23. THE WORLD: Mean Rainfall for JULY

Mediterranean lands are dry. The interiors of the northern continents are now low-pressure wet regions.

(4) In the southern hemisphere also, the rain belt is shifted north so that Central Chile, S. W. Africa and the South of Australia which were dry in summer (January) are now receiving winter (July) rains from the westerlies.

(5) South-eastern Asia is now having the wet summer monsoon season, while in Northern Australia it is the season of the dry winter monsoon.

Now compare the January and July maps and you will find that:—*(Vide* also Fig. 24)

(1) About the equator there is a belt of heavy rainfall. (2) In tropical latitudes the east coasts are wet and west coasts dry. (3) In temperate latitudes the west coasts are wet and east coasts dry. (4) Interiors of continents have scanty rainfall, most rain falling in summer. (5) Western

margins of temperate latitudes have most rain in winter, while the eastern margins have most rain in summer. (6) As the heat belt swings north or south with the sun so does the rain belt follow it.

Wet and Dry Belts.—This seasonal swing of the rain belts produces interesting results as will be seen from an examination of the figure opposite Duplication of climatic belts in Africa. But this figure applies only to the western margins of continents. Let us apply it to the western margins of Europe and Africa. From Norway to northern Spain there is an area of *rain all the year round.* From northern Spain to the Atlas region is an area of *winter rains* and *summer drought.* South of this lies the Sahara, the belt of *little rainfall.* Next comes an area of *summer rainfall*—the Sudan. The Guinea Coast and Congo Basin have *rain at all seasons.* South of the equator the belts are repeated in reverse order, though

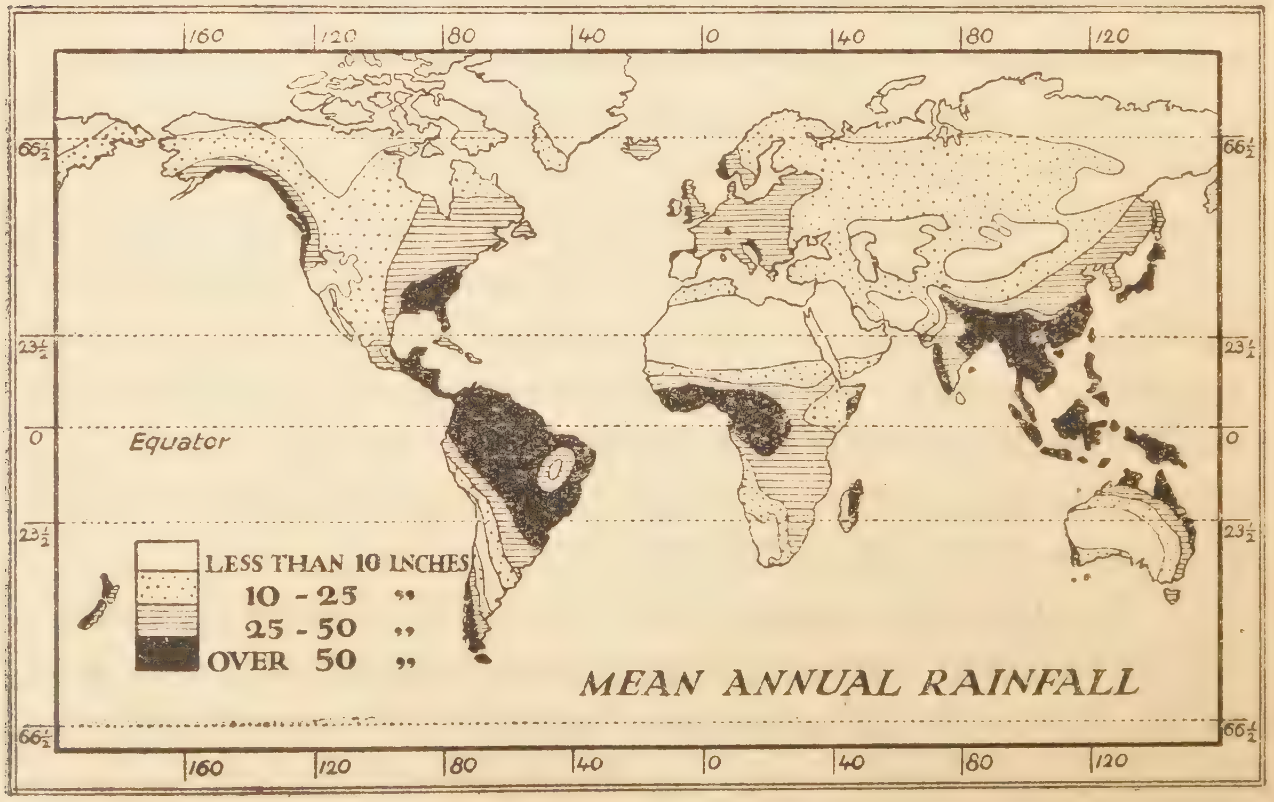


FIG. 24. THE WORLD: Mean Annual Rainfall

in Africa there is no area corresponding to Western Europe.

On the east coasts of continents the trade-wind belt is frequently a region of rain, for the trade winds come from the ocean. Therefore in the latitudes of about 20° to 30° where the west coasts are desert the east coasts have fairly heavy rains.

Mean Annual Rainfall Map.—Fig. 24 shows the average total rainfall for the year. Regions with over 40 inches are said to be *very wet*, those with under 10 inches, *dry*, and those with 10 to 40 inches are moderately wet. Study the map along with (1) a relief map of the world, and (2) the maps showing the distribution of pressure and winds in October.*

NATURAL VEGETATION

Generally speaking, regions of heavy rainfall are forested, regions of light rainfall are grasslands, and regions of scanty rainfall are deserts. Temperature is also an important factor determining vegetation, so that we have tropical and temperate forests and grasslands, and tropical, temperate and cold deserts.

Fig. 25 (see next page) shows the general distribution of natural vegetation, and it should not be forgotten that there is a gradual merging of one type into another. Study this map along with figure 24 which shows the Mean Annual Rainfall of the World and note the close connection between the two. Refer also to the temperature and relief maps. The chief types of natural vegetation are :—

(1) the *Hot Wet Forests* which include the equatorial and the monsoon rain forests; (2) the *Tropical Grasslands*

**Note.*—Low pressure belts are regions of considerable rainfall, as high pressure belts are regions deficient in rain.

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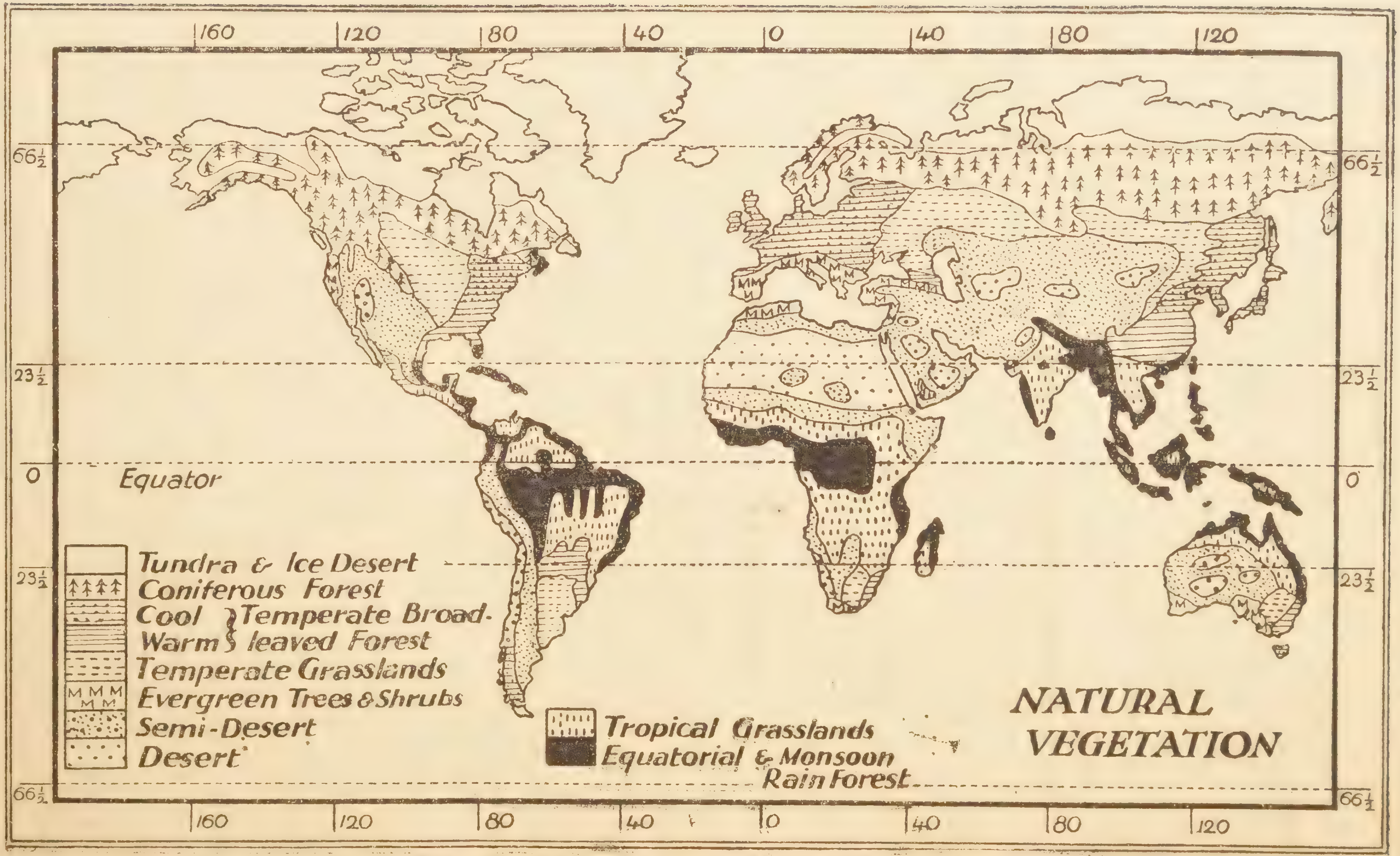

FIG. 25 THE WORLD: Natural Vegetation

or *Savannahs* ; (3) *Desert and Scrub* ; (4) *Temperate Grasslands* which include the steppes of Eurasia, the prairies of North America and the pampas of South America; (5) *Evergreen forests* found on the western as well as the eastern margins of continents in warm temperate latitudes; [In the former the summers are dry and the winters are moist and cool *e.g.* Mediterranean lands; in the latter summers are moist and warm, and winters cold and dry *e.g.* Central China; the trees of the western forests have smaller and drier leaves than those of the eastern forests.] (6) *Deciduous* or *Broad-leaved forests* in the mid-temperate belt ; (7) *Coniferous forests* in the cool temperate regions ; (8) The *Tundra* along the Arctic shorelands of the northern continents.

For a detailed description of the various types and the climatic conditions required for each, a reference may be made to Chap. III-*Eurasia* and Chap. V-*N. America*.

In mountainous areas vegetation varies with altitude. *Vide* Andean and Himalayan Zones.

EXERCISES

(1) Give reasons for the heavy rainfall of (i) the equatorial latitudes, (ii) the western margins of temperate latitudes.

(2) Explain why rain belts migrate northwards in northern summer and southwards in northern winter. What are the chief results of this migration? Draw a map of the west coasts of Europe—Africa showing the chief climate belts.

(3) State, and account for, the differences in climate between the western and eastern coasts of a continent in latitudes 20° to 30°.

(4) Why is it that (i) the Deccan plateau is drier than the west coast of India? (ii) Patagonia is a semi-desert?

(5) With reference to any three of the Natural Vegetation zones show how climatic conditions determine the kind of vegetation in each.

CHAPTER VI

REGIONS OF THE WORLD

NATURAL REGIONS

The world can be divided into "natural regions" each having its own characteristic climatic as well as vegetation conditions. The word "natural" is used as opposite to "artificial or political", for, a natural region ignores the political boundaries set up by men between their provinces or countries. In studying the "natural regions" we should also take into account the people living there. We should be able to find out how their occupations and ways of life are influenced by their physical environments (*i.e.* physical features and climate) and also the changes that they are able to make in that environment. The life of the people of the tundra, the steppe or the desert illustrates how man's life is influenced by his physical environment. The irrigation works of the Punjab, the harbour of Madras, the artesian wells of Australia, the cutting of the Suez and Panama canals, the reclamation of land in Holland—all these illustrate how man is able to change his environment. Each "natural region" of the world is a group of natural regions where the same conditions prevail. You know that in every continent there is an area which has a "Mediterranean" type of climate and vegetation. All these areas can be grouped together to form one natural region ; for example, the countries bordering the Mediterranean Sea, California Valley in North America, Central Chile in South America, the S. W. Corner of South Africa, the S. W. Corner and south of Australia and the northern island of New Zealand have all the same kind of climate, *viz.*, warm dry summers and cool wet winters, and the same kind of vegetation, *viz.* evergreen trees and shrubs. Hence all these are grouped into one natural region, named the *Mediterranean Region.*

The various regions which make up a group may differ in certain respects. These differences are generally due to the differences in structure and relief which greatly affect the character of the people and their work.

In the following pages we are going to study some of the Major Natural Regions which more or less correspond to the Natural Vegetation Regions.

(1) The Tundra and Ice-cap.—The Tundra lowlands lie along the Arctic shorelands of North America and Eurasia. The winters are long and severe and the summers, short. For two-thirds of the year the tundra is buried in snow. The vegetation consists chiefly of moss and lichens with low, berry-bearing bushes. A few people live in this region—the Eskimos of Canada, the Lapps of north Europe and several tribes in Siberia. The only animal of importance in the *Old World* is the reindeer which has been domesticated. In the New World, the caribou, an animal of the same family, is generally hunted. An attempt is now being made to introduce the reindeer in the new world also. The Scandinavian highlands and the northern part of the Urals come under this region. Study the life of the Eskimo (North America) and of the tundra-people (Eurasia) and see how their ways of life are influenced by the geographical environment. To the south, the tundra passes imperceptibly into woodland.

Greenland is a typical example of ice-cap type. Here the combination of elevation and high latitude produces a more severe climate. Only the west coastal strip is habitable. The interior is buried beneath a sheet of ice of unknown thickness. Antarctica is also a plateau covered with an even thicker ice-cap. The seas surrounding Greenland are the home of seals, walruses and whales.

The conditions of the tundra and ice-cap are also found on the tops of high mountains. Why?

(2) **The Cold Forest.**—These forests occur chiefly in the cool temperate latitudes of the globe, where summers are short, winters severe, and rainfall often rather scanty. The characteristic trees are coniferous trees like the pine, fir, spruce and larch, all of which have needle-shaped leaves which prevent evaporation of moisture. The hardy birch, a broad-leaved tree, is also common. Most of the trees here are said to *sleep* during winter, *i.e.*, they do not grow as the ground is covered with snow.

The most extensive coniferous forests are found in northern Europe (Norway, Sweden Finland and Russia), Asia (Siberia) and North America (Canada). Similar forests cover the higher regions of Central Europe, such as the mountains of Switzerland and Germany and the Carpathians. On the western borders of the continents where winters are milder and rainfall heavier, as in Norway, British Columbia and Southern Chile, the conifers attain an enormous size.

The forests of the north give shelter to large numbers of fur-bearing animals, as the sable fox, mink and ermine. In the denser European forests the bear, the wolf and the boar still exist. In the forests of Western America the grizzly bear, the elk. the deer and other creatures afford excellent sport to the hunter. Hence hunting and trapping forms the first occupation carried on in these forest areas. Now lumbering and forest industry have become important. The timber of coniferous trees is *soft*, and is used for making doors, window-frames. etc., and also for making wood-pulp which is largely used in the manufacture of paper. In the coniferous forests fires are to be dreaded, for they might cause wide ruin if allowed to spread.

Eastern Canada is the most developed of these forest lands. Eastern and northern Siberia is in an initial stage of development, for the forests there are still the home of tribes who live by hunting, and transportation is difficult. In the cleared areas of Canada, agriculture, dairy-farming and fruit growing are carried on. There is mineral wealth both in Canada and Siberia, but mining is not important except near the Great Lakes of N. America.

(3) **The Broad-Leaved Forests.**—The broad-leaved forests of the cool temperate zone are also known as *deciduous* forests, for the trees shed their leaves in autumn. They flourish best where rainfall is over 25 inches annually and are found near the sea and in areas which are warmer than the coniferous forests. The shedding of the leaves serves to check loss of moisture by *transpiration*. The oak, the beech, and the elm are typical trees.

The Western and Eastern Cool Temperate Margins.—There are two sets of temperate broad-leaved forests : (i) Those on the west side of continents—such as the British Isles and North-Western Europe (including parts of Germany and France), parts of British Columbia, the southern island of New Zealand and Tasmania. (ii) Those on the east side of continents—such as parts of Eastern Canada, north-eastern United States, Manchuria and northern Japan. From the greater part of north-western Europe and eastern North America, the forest has largely disappeared, and in its place we find agricultural and industrial regions.

In British Columbia the area of cultivable land is very small, and so forestry, fishing and mining are the chief occupations of the scanty population.

In the lowlands of Western and Central Europe, wheat and barley form the staple crop. Along the Baltic shores rye is cultivated and further north, oats. Root crops include the potato and the sugar-beet, which are largely grown on the poorer soils of France and Germany. Sheep are kept on hill pastures, supplying wool, and cattle on the richer grasslands where dairy farming is important. The greatest natural resource of north-western Europe is its mineral wealth. Coal and iron led to the development of manufactures which was accompanied by a great growth of commerce. This in its turn led to the increase of population, and the equable climate made the people very hard working and enterprising. The countries of this region not only traded with other regions, but also acquired possessions in other continents and thus they became politically great.

Of the countries on the eastern side of continents, the Laurentian region is better developed than Amuria. The St. Lawrence is an important gateway from the Atlantic into the densely populated interior of North America, but the interior of Asia to which the Amur gives access is of little importance.

Warm Temperate Eastern Margin.—Broad-leaved forests of a different type are found on the eastern side of continents in the warm temperate latitudes. Here the trees are evergreen *i.e.*, in no season of the year they are bare of leaves. The south-eastern United States, Central China, Japan, Eastern New South Wales, Natal and Paraguay basin form one group. Here the summers are hot and the winters, cold ; rain falls mostly in summer. The summer heat and rainfall makes the regions very productive. Cotton, sugar, rice, maize and wheat are grown. Hence these regions are densely populated.

The Eastern United States has a large supply of coal and iron, and the progressive Americans have utilised them to carry on great manufacturing industries. The Paraguay basin has neither coal nor iron, and its people are not as progressive as those of U.S.A. The Natal region is a narrow strip, and though its productions resemble those of China, the quantities produced are necessarily small.

In China and Japan the people are Mongolian and differ greatly from those of the other regions of the group. The growing of rice, the cultivation of tea and the rearing of silkworms are peculiar to this region. Population is very dense, and much of the farming work is carried on by human labour as domestic animals are scarce. The great mineral wealth is now only beginning to be utilised. Though the industrial development of China is still in its infancy, Japan has rapidly advanced. These countries will also come under Monsoon Lands.

South-eastern Australia can be compared with eastern U.S.A. as regards the inhabitants. But its industries are yet to be developed.

(4) **The Temperate Grasslands.**—These occur in the interior of great land masses (Fig. 25) where the summers are comparatively hot and rainfall is only moderate or scanty. Winters are cold, and the lands, often snow-covered. The grasses are generally short, and complete their short life in the summer, when the rains come. As the rainfall is too scanty, the soil too loose, and the country too exposed to winds, few trees are to be seen. The prairies of North America, the steppes of Russia and Siberia, the pampas of South America, the Hight Veld of South Africa and the downs of Australia are all of this type, Where rainfall is very scanty, the grasslands give way to poor steppe or semi-desert as in Turan,

in Australia and in Western Argentina. Where the rainfall is sufficient, large tracts are used for the growth of cereals, chiefly *wheat.*

Over the prairies of North America roamed herds of bison which have now been almost exterminated by the greed of hunters. On the South American pampas the guanaco and rhea are common. On the steppes of Asia are vast herds of cattle, sheep, camels and horses. European settlers have introduced these animals in the prairies of N. America, the pampas of S. America and the downs of Australia.

The prairies of Canada and U. S. A. have become great wheatfields, but the area near the mountains is largely used for cattle and sheep-rearing. Beneath the soil there is coal which may one day form the basis of manufacturing industries. The Pampa region has no coal and so can have no manufactures; cattle-rearing is important and wheat and maize are largely cultivated.

The steppes of Eurasia include the fertile "black earth" region, and are very productive in their western portion. Here coal and iron are found and are being used in industrial towns. The eastern portion has less rain and is not so well developed. The Manchurian Basin has rich plains where agriculture is carried on by the Chinese and Japanese.

The importance of the Veld of South Africa is more due to its minerals (gold) than to its pastoral or agricultural industries. The Murray-Darling basin is best suited to the rearing of sheep and hence New South Wales supplies the largest quantity of wool. Wheat is now being cultivated with the help of irrigation.

(5) **Mediterranean Lands.**—These lie on the west side of continents in warm temperate latitudes between

30° and 40°. Owing to the swinging of the wind belts along with the migration of the sun north and south of the equator, these lands come under the trade wind belt in summer, but in winter they come under the belt of westerly winds. Hence the summers are hot and dry, and the winters mild and wet. Such a climate, as you know, is known as the Mediterranean climate as it is found in the countries bordering the Mediterranean Sea. Which other parts of the world enjoy this climate? The natural vegetation is of the evergreen type. The cork-oak, the olive, the fig and the vine which have either thick barks, thick leaves or long roots, are characteristic of this region.

The olive and the vine were first obtained in the Mediterranean region of Europe, Africa and Asia, and they have been introduced into the other regions on account of the similarity of climate. The hot dry summers are suitable for growing fruits. In all the "mediterranean" lands wine is becoming an important product. Cereals are also cultivated here, but irrigation is necessary in summer.

California and Central Chile are restricted to narrow strips by the mountains along the Pacific coast. Behind California, Central Chile, Cape of Good Hope and South-Western Corner of Australia there are highlands or plateaus from which gold and other minerals are obtained. There is much commerce in the regions of this group. California is one of the chief oil-producing regions of the world.

(6) **Desert Lands.**—Deserts are found wherever the annual rainfall is less than 10 inches. Vegetation is of the scantiest. Cacti and other plants adapted to endure the prolonged drought are the characteristic vegetation. Ostriches, the desert fox and the lion, lizards and snakes are the chief animals.

Broadly speaking, deserts occur on the western side of continents in trade-wind latitudes. Their extent varies with the size of the land mass. The Sahara and Arabia are extensive deserts in the Northern hemisphere. The Thar desert in India and the deserts of North America are much smaller. In the Southern hemisphere are the Peru-Chilean deserts of South America, the Kalahari of South Africa and the great western desert of Australia. (For a description of the Sahara and its oases *vide*, AFRICA Chapter. IV).

The Nile and the Indus lie within the desert belt, and their valleys are made fertile by irrigation works and support a considerable population. Many products can be obtained from these irrigated lands, and wheat and cotton are exported in large quantities.

The Arabian desert is a continuation of the Sahara, from which it is separated by the narrow Red Sea. The Iran plateau has extremely scanty rainfall and is therefore scrubland, the only fertile parts being valleys and districts that can be irrigated from the mountain streams. The Aralo-Caspian depression is almost a desert; but along the rivers oasis settlements have formed, and some of these have developed into trading towns connected with the markets of Europe by railways. The Tarim basin and the Gobi desert have a colder climate than the other arid regions on account of their latitude and altitude. There are centres of caravan trade, as the caravan routes from the fertile lowlands of China pass through this region.

The North American desert lies in the shut-up plateau area. The Great Basin and part of the Mexican plateau are scrubland. Cultivation by irrigation is being introduced. Minerals form an important source of wealth in this area.

In the Peruvian part of the South American desert, narrow strips along the rivers which cross the desert from the Andes to the sea are cultivated, and form what are called "little Egypts." In north Chile the large deposits of nitrates are of commercial importance. The towns engaged in the nitrate industry have to get their water supply from the distant Andes.

The desert and scrublands of South Africa are relatively of little value. This region is occupied by the poorest type of natives, the Bushmen and Hottentots.

The desert of Australia has no oasis settlements; but it is now traversed by a railway near its southern margin, and there are also some stock routes. Large deposits of gold occur in the south-west where there are settlements which have to get water by pipes from the west coastal margin.

(7) **The Equatorial Forests.**—These hot, wet forests occur within about 10° of the equator. The temperature is high at all seasons and rain falls throughout the year. The forests of the Amazon and Congo basins are typical. They are remarkable for the numerous species of trees and for the struggle for light and air which goes on among them. The dense foliage shuts out sunlight; hence the forest is dark and gloomy. The animals are of the kind described in the section on equatorial Africa.

The trees of commercial value are; (1) rubber in the Amazon basin and West Africa, (2) the oil-palm of the Guinea coast, (3) the gutta-percha in the East Indies, and (4) cabinet woods like mahogany and ebony. The native inhabitants who are very backward in civilisation, are few in number, and live by hunting and fishing. Some agriculture is practised, but it is of a primitive type. White men find it difficult to live in these fever-haunted regions, hence their stay is temporary and their plantations have to be worked by native labour. Cacao and manioc are characteristic products of these plantations. Sugar, rice and bananas are grown in the lowlands, and coffee on the highlands. Near the sea, on sandy shores, the cocoanut palm is seen everywhere.

All regions are not equally developed. The Amazon region can be easily reached by the rivers from the sea, but much of the interior is inaccessible and unhealthy. The native Indians are uncivilised and white men cannot settle here. Little can be done to improve health conditions, hence this region will remain one of the least populated and least developed areas of the world. The North-western coastal region has the same vegetation as the Amazon basin; but it is easily accessible by sea and has been developed by the Spaniards and their descendants.

The Guinea coast-lands of Africa are similar to the North-west coastland of S. America, but they are governed by the English and the French and so their developments are more rapid.

Unlike the Amazon, the Congo is interrupted by falls, but this obstruction has been remedied by railways. The Congo region is less swampy and less densely forested than the Amazon region. Clearings are more easily made and population is denser. Under European control it can be developed long before the Amazon region.

In the East Indian Island region, the climate is insular and there are no very great expanses of swamp-land. Immigrants from other parts of Asia have greatly raised the level of the native inhabitants. In the Dutch islands especially in Java, agriculture is developed, and coffee, sugar and other tropical products are cultivated. Spices are obtained from the forests, and sago forms the chief food of the natives.

(8) **Tropical Grasslands.**—These lands are found on either side of the equatorial belt. Here in summer the sun is overhead or nearly overhead at midday and 'rain follows the sun.' Hence the summer half of the year is hot and rainy, and the winter half is cool and dry. This type of climate is well developed in Sudan in Africa, and hence is often known as the Sudan type. The season of heat and rain is the season of growth for the grasses which form the natural vegetation of this region. The grasses are taller than those in the temperate grasslands. The vegetation is of the *savannah* type, where the grassland is diversified with clumps of trees which give it a park-like appearance. (*Vide* : Savannah region in AFRICA Ch. IV). On the drier grasslands cattle-rearing is the chief occupation ; in the better watered places sugar, rice, cotton, maize, etc., are cultivated ; on the hill slopes tea and coffee are grown.

Central America, West Indies, the llanos and campos of South America, the Sudan region, the East and South African Highlands, Madagascar, parts of Northern Australia and the Monsoon Lands of India and Indo-China fall under this group.

Central America and the West Indies are better developed than the South American savannahs. In Central America, products vary with elevation. The three climate zones—*tierra caliente*, *tierra templada* and *tierra fria* are to be found. The Guiana Highlands are inaccessible, and are least developed. In the Venezuelan llanos cattle-rearing is going on. The Brazilian region is inaccessible and undeveloped in its western portion ; but the Atlantic margin is productive. The coastal lowlands and the plateau behind Rio de Janeiro are important agricultural regions. South Brazil is suitable for white settlement.

In the Sudan Region, the central part, Nigeria, is more densely peopled and more productive than the eastern and the western parts, for the native tribes there are more highly developed. The East and South African Highlands are cooler because of their elevation, and are suited to white settlement. These areas are under the control of Europeans who are now beginning to occupy them and develop them. Northern Australia will remain undeveloped, for it is largely an "empty" land from the point of view of population. While the climate will not allow white men to settle in large numbers, the 'White Australia policy' prevents Asiatics from settling there.

(9) **The Monsoon Lands.**—These are so called because, here seasonal winds, called monsoons, blow. These lands have outflowing winds in winter, the dry season, and inflowing winds in summer, the wet season. These can be subdivided into (1) cool temperate, (2) warm temperate and (3) tropical regions. (*Vide:* EURASIA Ch. II). Of these the first two have already been referred to. Here we shall consider the tropical region which includes India, Indo-China, South China and the Philippine Islands. These resemble the savannahs in having a hot, wet summer and a cool, dry winter.

As the relief of the land within this area varies considerably, there are also differences in the amount of the rainfall and in the natural vegetation. There are no extensive areas of grasslands as in the Savannah. Here the wet mountain slopes and highlands are forested, *e.g.*, the seaward slopes of the Western Ghats, the southern side of the Himalayas and the highlands of Indo-China. These monsoon forests are not so dense as the Equatorial forests and they can be easily cleared for agriculture. Teak and sal are important timber trees, and bamboos and mangoes flourish. Rice is grown in the wet lowlands and millets and oilseeds in the drier parts. Wheat is a winter crop. Cotton, tea, sugar, jute and other industrial plants are also cultivated. (For a fuller account *vide* India and Indo-China).

Highly developed communities have been living in this region and hence the agricultural resources of the soil have been thoroughly utilised. The people are intelligent and hard working. As a whole the region is one of the most densely populated in the world, with great cities and much trade. Contrast this area with the monsoon lands of North Australia.

(10) High Mountains and Plateaus.—The mountain region of the two Americas and the central Asian Highlands enclose high plateaus which include ridges and valleys. These regions are cool or cold according to their elevation, and vegetation varies with altitude. (*Vide* Andean zones and vegetation of the Himalayas) They present great difficulties to communication and they are scantily populated. But the mineral wealth of the Rockies and the Andes has necessitated the construction of railways. The Alps in Europe contain very little mineral wealth, and they no longer form a barrier to communication as they have been pierced by railways. On the whole mountain regions prevent most of man's activities; but they can supply him water power for his industries. Bolivia and Tibet can be taken as typical plateaus. Large herds of llamas, vicunas and sheep are kept on the former, and yaks on the latter.

(11) The Pacific Islands.—From your atlas you can see that the islands of the Pacific are innumerable. Most of them lie between the tropics in the western half of the ocean. New Zealand and a few islands bordering

Asia and N. America lie outside the tropics. Islands are generally divided into two classes: *continental* and *oceanic*. New Zealand and New Caledonia are examples of continental islands, for they are fragments of a greater Australian continent. The oceanic islands are formed either of *volcanic* or *coral* rock. The New Hebrides, Fijian, Samoan, Hawaiian and Society groups are some of the important volcanic islands. The volcanic islands are "high," and the coral islands, "low."

The coral islands are composed of the hard skeletons of tiny creatures, called *coral polyps*, which can live only in shallow, warm, clear water. These creatures build a reef in the shallow water near the shores of a volcanic island. Thus a *fringing reef* is formed. If the island happens to sink slowly, the reef-building continues, and the fringing reef surrounds the steep island. Gradually the central volcanic height disappears under the water, and the ring-shaped reef enclosing a lagoon forms a coral island, called an *atoll*. The sand and fragments of coral heaped up on these atolls form a soil valuable for vegetation.

The climate of the islands is wonderfully equable. Most of the islands lying in the trade-wind belt enjoy a healthy and pleasant climate. In the equatorial islands it is not so very healthy. The rainfall is distributed throughout the year.

Round the coasts and on the coral islands the *cocoanut palm* is the chief tree, and *copra* the chief product. The volcanic islands have a wider range of products; cocoanut, yam, breadfruit and bananas. Sugar, rice, coffee and maize are found in the plantations. The people of the islands are either Melanesian (dark and frizzy-haired) or Polynesian (tall and wavy-haired). The Maoris of New Zealand are of the latter type.

The islands south of the equator are governed either by the British or the French, with the exception of part of the Samoan group which belongs to the United States. Most of the islands north of the equator belong to Japan, but the Hawaiian Islands are owned by the United States. The Islands which belonged to the Germans before the Great War, have now passed under mandates to the Japanese or British.

New Caledonia (French) is rich in minerals. Cocoanut, sugar, cotton, coffee and cereals are cultivated. Stock-raising is also important. The capital is *Noumea*, on an excellent harbour. The island is used as a penal settlement by the French.

The Fiji Islands (British) consist of two large volcanic islands and numerous smaller ones. They are forested. Sugar, maize, rice, cotton, tobacco, tea and bananas are grown. The capital is *Suva*, an important calling station for vessels journeying between New Zealands and Australia, and the west coast of North America.

The Hawaiian or Sandwich Islands.—(U. S. A.) The largest of the group is Hawaii. The islands are forested, and yield the same products as the Fiji Islands, sugar being the most important. The Capital is *Honolulu*, an important calling place for vessels plying between North America and Asia and Australia.

New Zealand.—(Fig. 26) (British) Of all the Pacific Islands, the most important is the Dominion of New Zealand. It has a total area of about, 104,000 square miles. It consists of the large North and South Island, separated by the Cook Strait, and of the smaller Stewart Island in the south. Like Japan it is mainly a mountainous country. The main trend of the mountains is from north-east to south-west. In South Island the Southern

Alps lies near the west coast, while its continuation in North Island lies near the east coast. In the latter island there runs N. W. to S. E. a long narrow peninsula whose coastline is broken into many bays. There are volcanoes in all stages of development and geysers round Lake Taupo in North Island. To the east of the Southern Alps lies the only plain of importance — the Canterbury Plain.

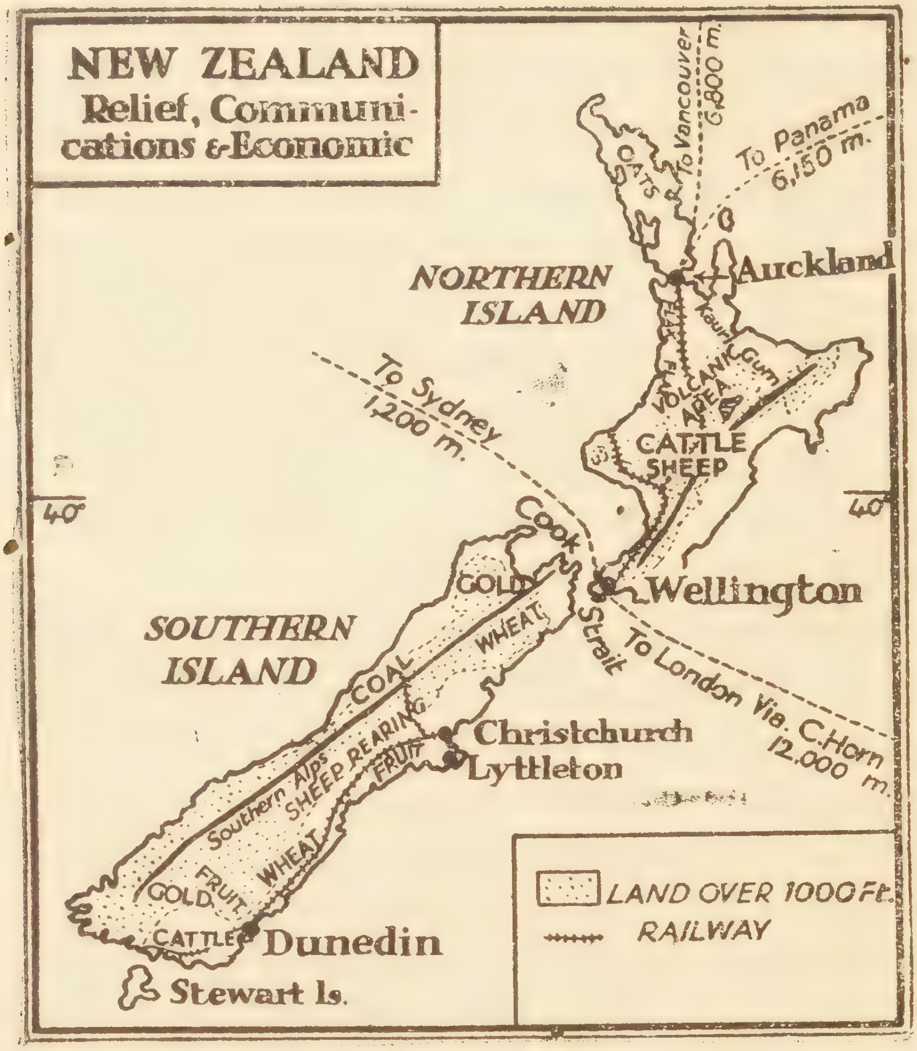

FIG. 26. NEW ZEALAND
Relief, Communications and Economic.

The climate is equable. The northern part of North island has a 'mediterranean' climate. The rest of New Zealand is always in the Westerly-wind belt; hence rainfall is heaviest on the western slopes of the mountains in South Island. Most of the North Island and the west of South Island are forested. The northern forests contain the *kauri* pine which yields a valuable gum used in the manufacture of varnish.

In North Island, mediterranean fruits like oranges, lemons and grapes are cultivated; in the marshy areas is found the *New Zealand flax* whose fibre is used like hemp in the manufacture of rope. In the other agricultural areas temperate fruits and cereals are grown. The country is rich in minerals, especially in coal and gold.

The white settlers have introduced domesticated animals, the upland meadows being stocked with cattle and the drier eastern plains with sheep. Millions of sheep are grazing on the Canterbury plains supplying not only wool, but also fine mutton which is frozen and exported through *Christchurch* and its port *Lyttleton*.

British colonisation of the island began about 1840 and was vigorously opposed by the natives-the Maoris. These have now adopted Christianity and have attained a considerable degree of civilisation. They are admitted to political rights and form about 4 per cent of the total population of 1½ millions. New Zealand, like Australia and Canada, is a self-governing colony of Great Britain. The New Zealanders, like the Australians, wish to keep their country a "White Man's land."

Auckland is the chief port and largest city of the Dominion, and *Wellington*, the capital. The greater part of the country's trade is with Great Britain, the exports being mainly raw products; and the imports, largely manufactured articles.

(12) **Industrial Regions of Europe.**—Before the invention of the steam-engine, almost every manufacture was located where the raw material was produced; the power required to drive the machines was provided by man or animals. Before the value of coal as a source of heat, needed to smelt ore, was known, charcoal was used. When the use of steam-engine as a source of power was once practicable, the positions of manufactures were changed. The raw materials no

longer decided where the factories were built; the power was much more important, and it had to be obtained with the help of coal. As coal was needed in large quantities, it was found cheaper to take raw materials to the coalfields than to move coal to places where the materials were produced. Hence factories were located on or near coalfields. Figure 27 shows the distribution of coal in Europe. The chief fields are in the British Isles, France, Belgium, Germany, Czecho-Slovakia and Russia. Refer to these regions in EURASIA.

The development of manufacturing industries in Europe is due to the following facts: (1) There is a large

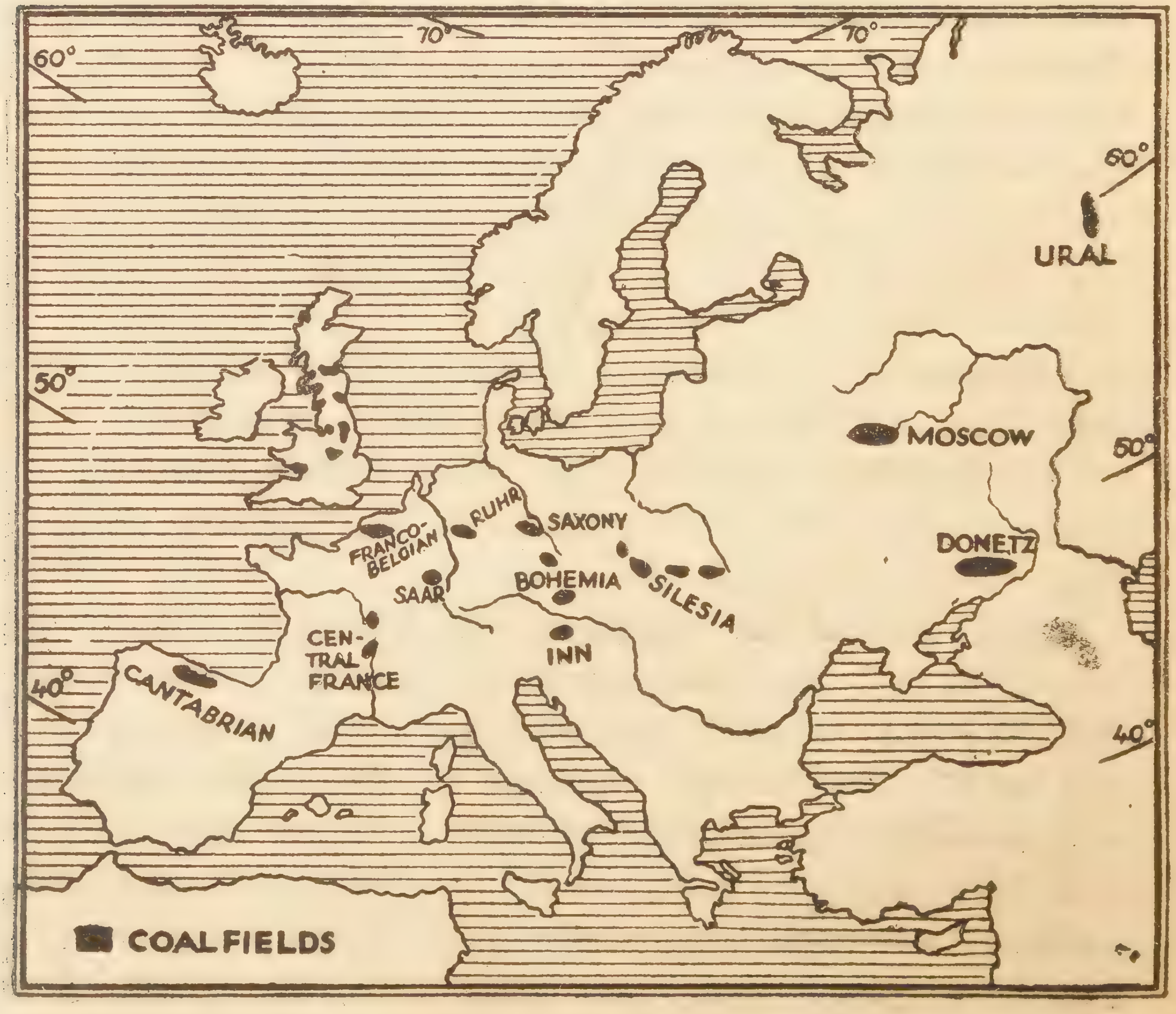

FIG. 27. Coalfields of Europe

supply of coal and iron. (2) The plain of Europe allows a network of railways for the carriage of goods, and the long navigable rivers linked by canals make easy waterways. (3) The climate is mild especially in the west, and encourages all human activities. (4) The people are highly civilised and enterprising. (5) Markets for the manufactured goods are available in the southern continents and Asia. (6) Large steamers carry these goods cheaply across the ocean, and bring back in exchange raw materials for the manufactures and foodstuffs for the dense population.

The south of Europe has little coal, and is therefore deficient in manufactures, and the few that are carried on depend on water-power supplied by mountain streams.

(13) Industrial Regions of North America.—The industrial centres of North America lie on the eastern side of the continent. Figure 28 shows the distribution of minerals in eastern Canada and United States. The people here are of European origin, and are therefore civilised. The rich mineral deposits, the supply of raw materials, the easy rail and water communication, the temperate climate, and the good water-power have caused this country

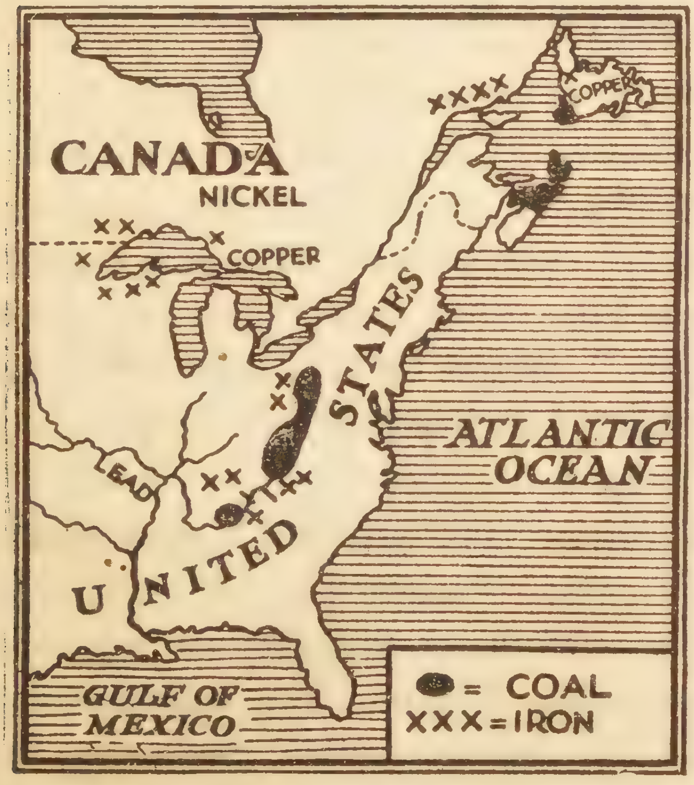

FIG. 28. Industrial regions of N. America

to compete successfully in the same markets as the chief manufacturing countries of Europe. In addition to coal, there are valuable supplies of natural gas and oil which are now being extensively used in manufactures. New England is a marked exception to the general rule that industries are concentrated upon coalfields, for no coal is found there. The industries began before the days of steam-power, and people then knew how to use water-power. In recent years, water-power has been employed to produce electricity by which machines are now driven. (*vide* NORTH AMERICA).

(14) **Regions of the Empire.**—If you look at the World map in your atlas showing British Empire, you will find all the British possessions marked red. The British Empire consists of Great Britain and Northern Ireland, the self-governing Dominions (including the Irish Free State), the Crown colonies, possessions and protectorates. Britain beyond the Seas is more than 130 times as large, and nearly 10 times as populous as the United Kingdom of Great Britain and Northern Ireland. There is no continent which does not contain some land belonging to the British. Throughout the oceans are scattered numberless islands where the British flag flies. Hence it is said that "the sun never sets on the British Empire." Great Britain maintains safe communication between different parts of the Empire with the aid of her efficient navy.

The regions of the British Empire can be classified on the basis of climate: (1) *Cool Temperate Regions*; *e.g.*, the Dominion of Canada and New Foundland and New Zealand; (2) *Warm Temperate Regions e.g.*, the Commonwealth of Australia, British South Africa including the Union of South Africa, South-west Africa and Southern Rhodesia; (3) *Tropical Regions e.g.*, India, British West

Indies, British Guiana, British West, Central and East Africa (including Nigeria, Northern Rhodesia, Kenya colony and Tanganyika Territory).

Of these, the first two regions are "*Lands for Settlement*," for here the climate is suitable for white settlement. The northern half of Australia is within the tropical region, but the population there is very small. Southern Rhodesia, is wholly tropical, but its elevation makes it fit for settlement. It is worthy of note that almost all the self-governing dominions and colonies are situated within the temperate zone. These countries, being colonised by highly civilised people, have been rapidly developed.

The population of the British Isles is dense, while that of the self-governing dominions is very scanty; hence emigrants from Britain are going in a constant stream to the dominions. Besides, the migration is made easier by the knowledge of the prospects and conditions of life in each colony spread by the colonists themselves who send to the mother country well-illustrated literature, experienced lecturers and good business agents. The British Government, too, has its emigration office which assists in the work. The colonies not only provide homes and occupation for the overflowing British population but also purchase a great part of the manufactures produced in Britain, supply food to those that stay at home, and provide raw materials for the factories. In times of need, as in the Great War, they have proved themselves true *daughter states* by giving the mother country real help and support. In this respect even the tropical possessions have not lagged behind.

At present, the Dominions are beginning to build up their industries, and as these develop, their trade with

Britain will be affected. For instance, Australia will cease to export to Britain its wheat and wool, but will manufacture the wool, for its own needs and use the wheat to feed its increasing population. In the same way the other Dominions also will develop their industries. They will no longer export to Britain all their raw products, nor will they require to import much of their manufactured goods from Britain. With the development of industries, the population of the Overseas Dominions is bound to increase. These Dominions are no longer called British possessions, but they belong to the British Commonwealth of Nations.

The utilisation of the temperate lands did not satisfy the needs of the growing industries of Britain. So it had to turn its attention to tropical lands to obtain food and raw materials. The great heat and excessive moisture of the tropical lands make it impossible for white men to live permanently there. But these tropical lands are storehouses of commodities that are required by modern civilised countries. Food stuffs like sugar, rice, tea, coffee, cacao and bananas, and raw materials for manufacture like cotton, jute, hemp, rubber, dyestuffs and ores of minerals are but a few of the long list of articles that are found in the tropical countries. Further, many manufacturers look to tropical regions for markets in which to sell their products. Hence Britain is greatly interested in the utilisation and development of tropical lands which provide employment as managers, overseers, and administrators for large numbers of her young men. Hence the tropical regions are considered as "*Lands for Exploitation*". Of all the British possessions in the tropical regions, India is the biggest. It is on the way to self-government. It is also a crowded country like Great

Britain, and its people have been introduced as labourers in some parts of the Empire, but they are not welcomed where they come into competition with white men. Even though the Indians are citizens of the British Empire, they are denied access to parts of the Empire, *eg.* Australia and New Zealand. Even in places where they have domiciled (*ie.* have their homes) as in South Africa, and East Africa they are denied full and equal rights of citizenship: This is felt as a serious grievance by the Indians, both in the Dominions and in India itself. Some attempt is being made to solve the Indian problem in South Africa by agreement between the Government of India and that of South Africa. India is now reckoned as one of the members of the British Commonwealth, and, like the self-governing Dominions, is a member of the League of Nations.

A third set of British possessions consists of isolated posts along the main lines of communication which form *calling, coaling and strategic stations, eg.*, Gibralter, Malta, Aden, Singapore, Hangkong, Ascension, St. Helena, Mauritius, Fiji Islands etc., Revise what you have already studied about the various parts of the British Empire.

EXERCISES

(1) What conditions are taken into consideration in settling the limits of a "Natural Region"? Illustrate your answer.

(2) Describe briefly the situation, climate and natural vegetation of the temperate grasslands of the world. Why is wheat largely grown in these areas?

(3) What other regions of the world have a climate similar to that of North-western Europe? In what respects do these regions differ from North-western Europe?

(4) What is meant by the *mediterranean* type of climate? What are the characteristics of the vegetation found here?

What regions of the world have this type of climate? Account for their situation.

(5) State, and account for, the position of the chief arid regions of the world.

(6) Account for the similarities and differences between the South-eastern Monsoon Lands of Asia and Northern Australia.

(7) In what respects do the tropical savannahs differ from temperate steppes?

(8) What are the characteristics of the Equatorial Forest? How does it differ from the Cool Temperate Forest? Why is the Congo Basin more densely peopled than the Amazon Basin?

(9) Is it right to say that New Zealand is the 'antipodes' of Great Britain? Give the climate and resources of the Canterbury plains.

(10) Draw a map of the world and mark therein the British Empire. Name the several countries forming the Empire. Mark also the four sea routes from Britain to the East with the coaling stations on the way.

(11) Draw a diagram to represent the comparative areas and populations of Britain and the Dominions. "Discuss the probable alterations that will occur in the distribution of population in the future and the circumstances under which they will come about."

(12) Draw a map of the world and mark therein all the wheat-growing regions.

THE END

THE PATHS OF THE SUN AT THE EQUATOR, AT LONDON AND AT THE NORTH POLE

Figure 1 shows the apparent paths of the sun at the solstices and equinoxes as seen at the equator. N E S W is the horizon of the observer at the centre. On March 21 the sun rises due east, is overhead at noon and sets due west. From March 21 to June 21 the sun appears to rise every day a little farther north of east, and to set a little farther north of west, but at the same time the altitude of the sun at noon decreases. On June 21 the noon sun is 66½° above the horizon. From June 21 to September 23 it returns to

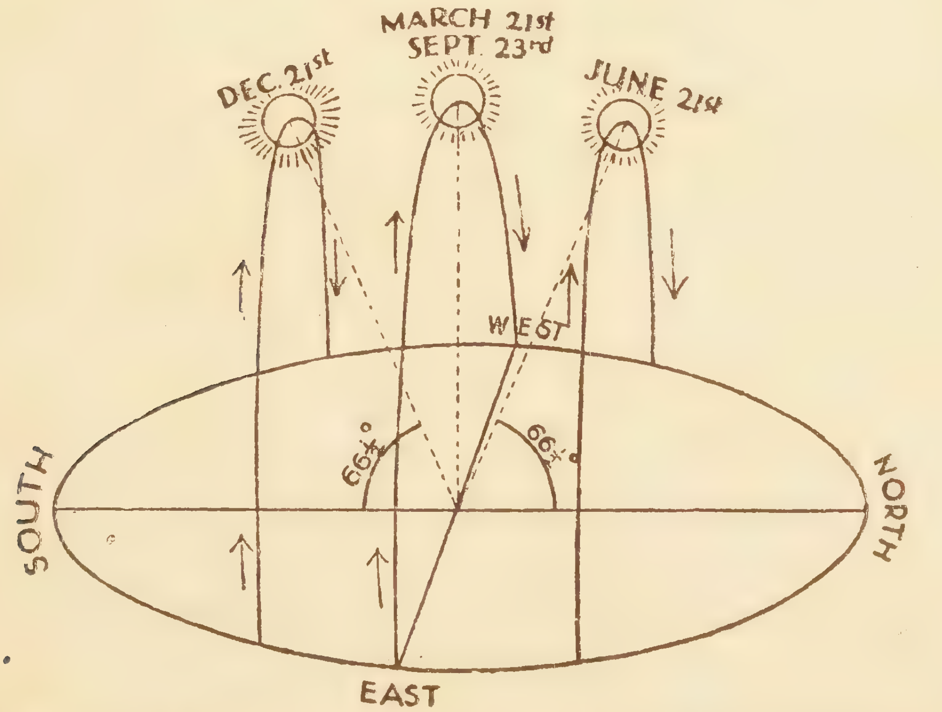

FIG. 1. Apparent paths of the Sun at the Equator

the zenith position. On December 21 the sun is at its southern limit and its noon elevation is again 66½°. From here the northward swing of the sun begins. Note that on every day of the year at the equator the sun rises at 6 a.m and sets at 6 p.m.; so that the day at the epuator is always 12 hours long.

Figure 2 shows the path of the sun as seen at London. Note: (1) the noon sun is always south; (2) the summer day is long, *e.g.*, on June 21 the sun rises at 4. a.m. and sets at 8 p.m.; (3) the winter day is short, *e.g.*, on December 21 the sun rises at 8 a.m. and sets at 4 p.m.; (4) on March 21 and September 23 day and night are equal; (5) at the winter solstice the sun is only 15° above the horizon; the height gradually increases: on March 21 it is 38½° and at the summer solstice it is 62°; then it decreases till it is again 38½° on September 23 and comes back to its winter position.

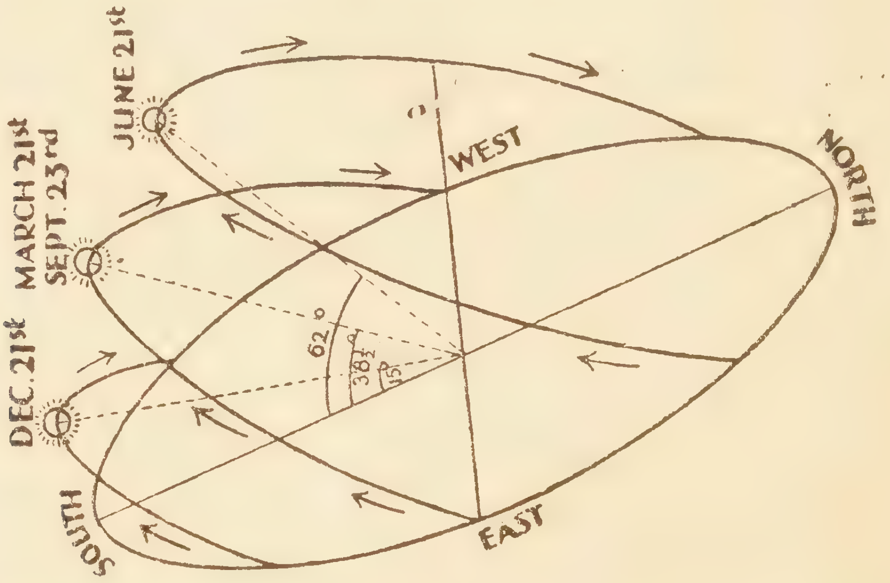

FIG. 2. Apparent paths of the Sun at London

Figure 3 shows the path of the sun as seen at the North Pole. To the observer at the north pole all directions are south. On March 21 the sun is seen circling round the sky on the horizon. Between March 21 and June 21 it appears to circle round, gradually increasing in height. On June 21 it is $23\frac{1}{2}°$ above the horizon. From June 21 to September 23 it gets lower and lower until on the latter day it is again on the horizon. Between September 23 and March 21 the sun is invisible for it is below the horizon. Thus at the North Pole the sun never sets for six months, and never rises above the horizon for the same period.

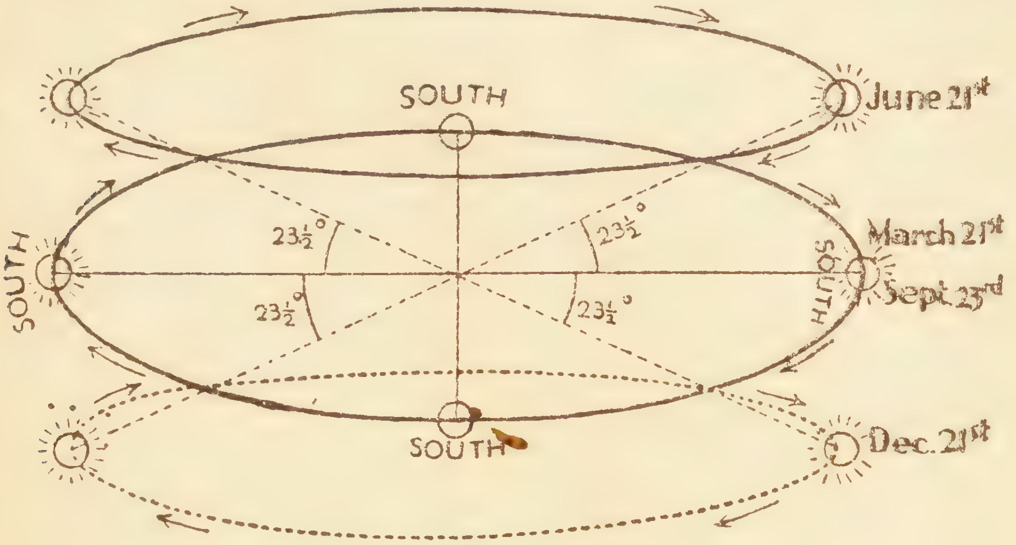

FIG. 3. Apparent paths of the Sun at the North Pole

EXERCISE

Draw diagrams to show the apparent paths of the sun at (i) the Arctic circle and (ii) the latitude of Madras.

The longitude of any place is determind by comparison of the local time with the greenwhich time. For example if the local time be 2 P.M. in a place and the greenwhich time is 12 noon. then the longitude is 30° east.

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